DECEMBER 1955

Building to Fit Your Handling Job

FACTORY

MANAGEMENT AND MAINTENANCE

Now the One-Man Department

Do Your Relays Work Right?

Beating the Breakdown Rap

Fastest Way to Update Skills

In *FORD'S* new Mahwah, N. J. Plant...

Ford Motor Company Assembly Plant, Mahwah, New Jersey. Archt. & Engr.—Giffels & Vallet, Inc. and L. Rossetti, Detroit, Michigan; Contr.—Fred J. Brotherton, Inc., Hackensack, N.J.; Subcontr. for Floors—San-Agate Cement Floor Co., New York, N.Y.

4-6 TIMES MORE WEAR-RESISTANT...

Ford's decision to install a Masterplate surfaced floor in their new Mahwah, N. J. assembly plant resulted from their careful study of ways to obtain a floor that would aid in the smooth flow of production, reduce maintenance expense and improve plant safety.

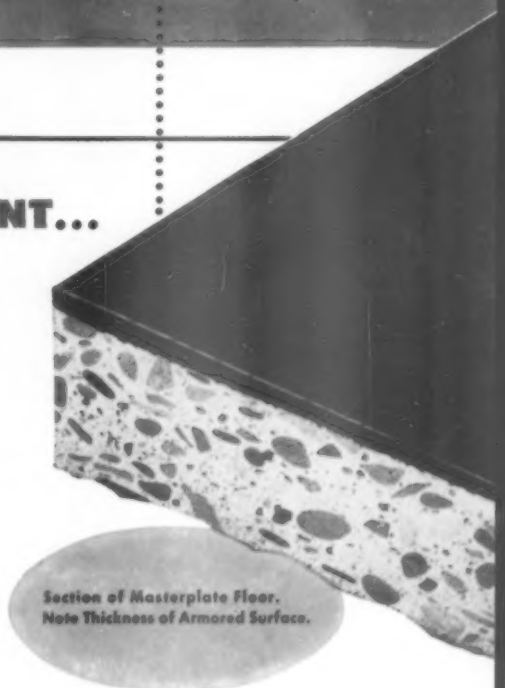
Many million square feet of Masterplate armored floors in service in America's leading plants show that Masterplate floors are 4-6 times more wear-resistant than the best plain concrete floor ...are non-dusting, corrosion-resistant, easy-to-clean, non-slip and spark-safe*. Non-colored and colored.

We will welcome showing you—

(1) why a Masterplate "iron-clad" concrete floor is the *lowest cost* floor you can install in your new plant.

(2) how your badly worn concrete floors can economically be made *better* than new by resurfacing with Masterplate.

*Static-disseminating, spark-resistant floors are produced with DPS Masterplate.



Section of Masterplate Floor. Note Thickness of Armored Surface.

The MASTER BUILDERS Co

Subsidiary of American-Marietta Company

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Photo courtesy Chas. Pfizer & Co., Inc., Groton, Conn.

No sore throat when rubber swallows quicklime

A typical example of B. F. Goodrich improvement in rubber

IN making soft, smooth gelatin they use sharp, destructive quicklime by the carload. It was unloaded from railroad car to factory in the best flexible metal pipe but it wore and ate through the pipe in a few weeks. Much too expensive.

A B. F. Goodrich man heard about this cost problem and suggested a regular stock hose with a special tough rubber lining developed by B. F. Goodrich engineers for unloading other troublesome materials.

This B. F. Goodrich hose was tried and has been handling a quarter million pounds of destructive quicklime a week ever since. It lasts five times as long as the more expensive metal, and is easier to handle from car to storage because it is so flexible.

This is one more of thousands of proofs of how B. F. Goodrich product improvement can save you money as it is saving so many other firms. The cost of anything, of course, is its price divided by the length of service it delivers. Buying for long service is the only businesslike way to buy anything and that is why B. F. Goodrich products cost so much less. The assurance such quality gives you, the time you save in buying, handling and repairs, are extra B. F. Goodrich dividends you get when you call your B. F. Goodrich distributor for the latest improvements in all rubber products you use. *The B. F. Goodrich Company, Dept. M-509, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

FACTORY | Reader's

MANAGEMENT AND MAINTENANCE

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SPECIAL REPORT

Building to Fit Your Handling Job 84

Ten commandments from the Material Handling Institute to help solve your handling problems before you build that new plant.

PRODUCTION

Now It's Point-of-Use Storage 90

No more stockroom headaches. Not with this simple system that keeps parts close by, saves $28,000 in handling costs.

Four Handling Cost-Cutters 94

One-Man Processing Line 103

Turning Operators Into Mechanics 106

A wider stretch for every worker's skills. That's how this company builds morale, cuts rejects to the bone, ups output.

How to Insure Power Tool Payoff 114

Make-'em-Yourself Controls 123

Two local wizards dream up and build precision controls for this plant. Gains: low cost, high quality — new business, too.

Need More Floor Space? Look Up! 130

See also "Special Report," listed above, page 84.

PLANT ENGINEERING AND MAINTENANCE

Cleaning Up Oily Waste Water 92

How to Plan Your Phone System 96

Low-Cost Hydraulic Maintenance 108

A three-cornered plan to keep you right on top of today's trend to wider use of hydraulics for machine-tool control.

Are Your Relays Working Right? 118

THE MAGAZINE OF PLANT MANAGEMENT FOR 64 YEARS

A McGRAW-HILL PUBLICATION

Member of Associated Business Publications and Audit Bureau of Circulations

FACTORY MANAGEMENT AND MAINTENANCE
DECEMBER 1955 Vol. 113, No. 12

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Guide for December 1955

Pumps Now Match the Job 121

More dividends from pumps? Sure. These rigid tests will ban guesswork, match motors to jobs, boost maintenance quality.

How to Beat the Breakdown Rap 132

For other articles dealing with plant engineering problems. see pages 84, 89, 123, 130, 136.

INDUSTRIAL MANAGEMENT

How Middle Managers Really Think 100

Like foremen, not like top managers, this survey says. And therein lies their own — and management's — greatest weakness.

A New Report on Hiring the Blind 126

Updating Maintenance Skills—in 8 Weeks' Time 136

Try This Self-Appraisal—Now 141

See also "FACTORY Human Relations," page 128.

DEPARTMENTS

Letters 3
Press Time—
—in Business . . *after* 80
—in Labor . . *before* 81
Opinion 83
Ideas of the Month . 112
You Be the Arbitrator 122
Human Relations . . 128
Cost-Cutters 142
News 144
Cost Index 146
Maintenance Trends . 148
Electrical Trends . . 150
Catalog News . 152, 242
Equipment News . . 154
Labor Relations News 222
Executive Health . . 236
Materials News . . . 266
New Books 276
New Films 282

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FACTORY | LETTERS

AUTOMATION FOR EVERYBODY

Sir:

Your excellent and timely treatise on automation ("What Automation Means to America," FACTORY, Sept. 1955) should help to dispel some of the fog that has shrouded the true meaning of 1955's management by-word. As Damon Van Utt, our director of manufacturing services, says: "Automation is nothing more than methods improvement in long pants."

Bruce Payne
Bruce Payne & Associates
Westport, Conn.

DIALING FOR TAPE

Sir:

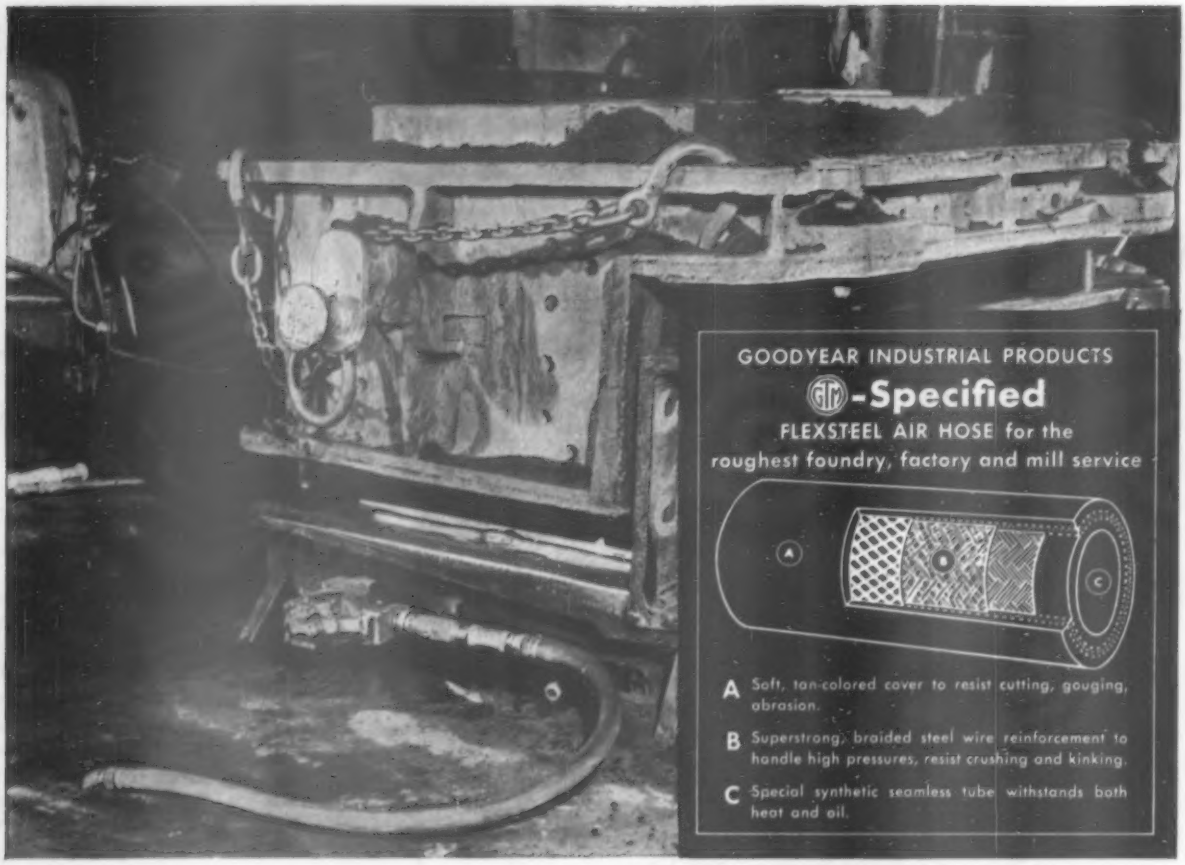
I have read your article on the Marsh Dial Taper (FACTORY, Aug. 1955, p. 124). As a user, I agree this is a worthwhile piece of equipment. We have found a way to make it even more useful.

We have a great many people taping in our various departments. Tape extending over the sides of the boxes (28 different sizes) varies from 2½ to 8 inches. Formerly, though we could produce from the Dial Taper the exact length of tape needed, our operators didn't always know just what length to use . . .

Now we simply print on the top and bottom flaps of every box the required lengths of tape—the first figure shown being the longitudinal strip; and the second figure, the two end strips.

Result: When the packer sets the box up, the necessary measurements are always before him. Actually, if the user is having his cartons printed, this

Turn to page 8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G-Specified
FLEXSTEEL AIR HOSE for the
roughest foundry, factory and mill service
A Soft, tan-colored cover to resist cutting, gouging, abrasion.
B Superstrong, braided steel wire reinforcement to handle high pressures, resist crushing and kinking.
C Special synthetic seamless tube withstands both heat and oil.

Heavy-duty, flexible air hose

sinewed with steel for high-pressure jobs

HEAT getting your hose? Abrasion cutting it to the core? Oil making it swell and break down?

Then FLEXSTEEL is the hose for you. For this latest development of the G.T.M. – Goodyear Technical Man – is designed to handle high-pressure air under the toughest foundry, factory or mill working conditions.

It's built with a special tube that resists heat and oil.

It's built with a special cover that resists cutting, gouging and abrasion.

And it's sinewed with superstrong, braided steel wire that resists crushing and kinking.

But for all its super-toughness it weighs far less than you'd expect, is surprisingly flexible for easy handling.

Many hose users have already proved FLEXSTEEL best for their jobs. They report longer hose life, better hose service, big reductions in hose costs.

Let FLEXSTEEL prove itself for you, too. Get full details from the G.T.M., your Goodyear Distributor or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

Flexsteel—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

FLEXSTEEL by

GOODYEAR

THE GREATEST NAME IN RUBBER

"One of the most useful books I own didn't cost me a cent"

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B.F.Goodrich

TW ANALYSIS boosts tire life in every department of Dana Corporation

Unloading 2 tons of clutch plate castings at Dana receiving dept.

7200 pounds of castings on their way to the production line.

Stored synchronizing rings outside the heat treating dept.

A load of Dana transmissions arrives in shipping department.

THE Dana Corporation manufactures truck and bus transmissions in its Toledo, Ohio, plant. Materials handling equipment is used to haul supplies, parts and finished transmissions all over the factory, from receiving room to shipping department. Tires roll through storage yards, over oil-soaked floors, over sharp steel shavings.

Here was a job for the B. F. Goodrich Tire and Wheel Analysis man. He studied Dana's equipment, loads and hauling surfaces. Then he recommended the right tire types, sizes, tread designs and tread compounds. Garageman Anthony Bosch says he's had tires that didn't last half as long as those recommended by the B. F. Goodrich TW Analysis man.

How about a FREE TW Analysis for you?

Dana Corporation's case is not unusual. The B. F. Goodrich FREE Tire and Wheel Analysis is saving time and money for industrial tire users all over the country. How about *you?* Just call your local B. F. Goodrich retailer or mail the coupon. This no-obligation Analysis includes money-saving maintenance tips as well as tire recommendations. You can be sure the advice you get is unbiased, because B. F. Goodrich makes a *complete* line of industrial tires. Act now! And if you manufacture materials handling equipment, there's a special TW Analysis for you.

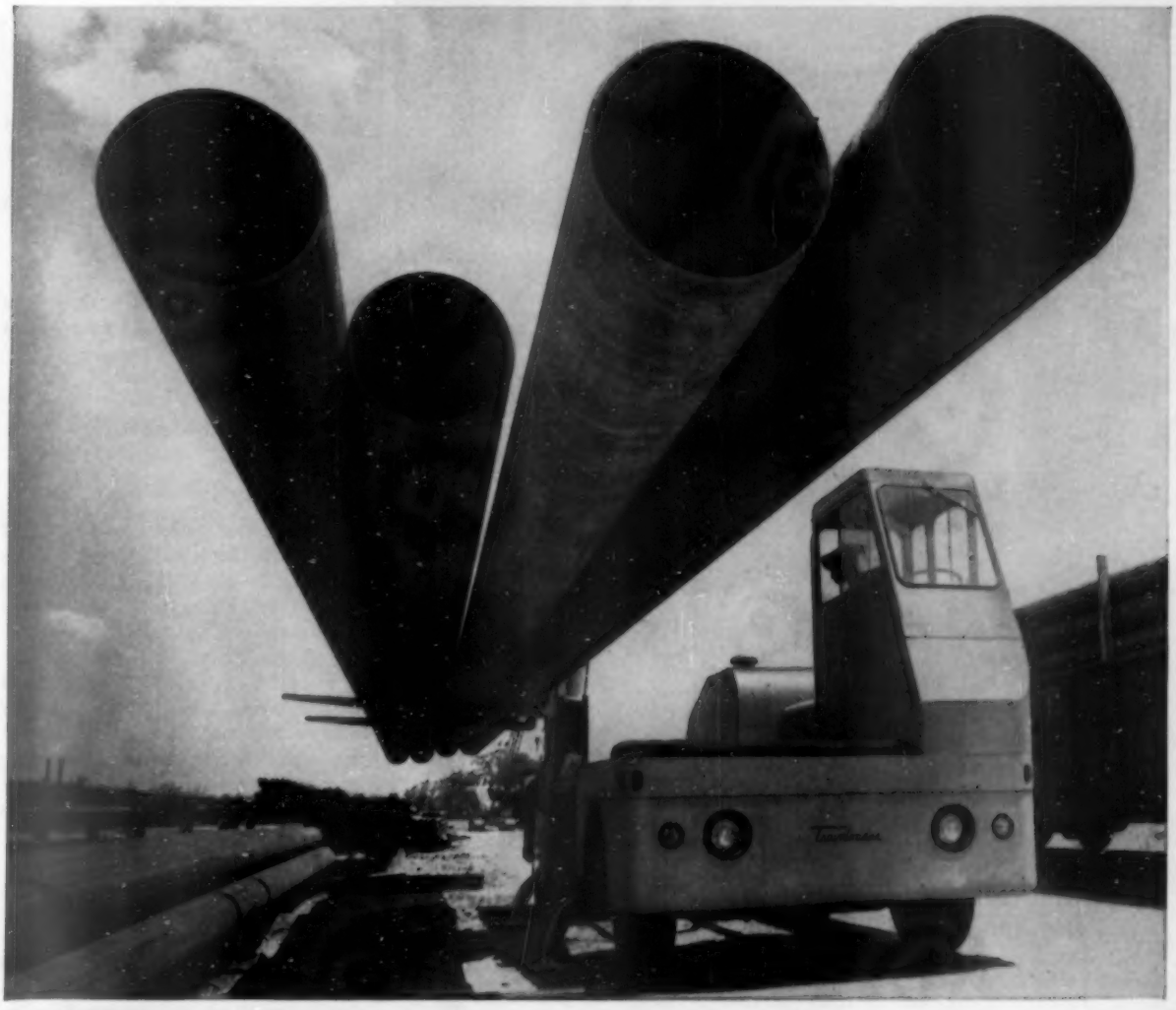
Specify B. F. Goodrich tires when you order new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

The B. F. Goodrich Company
Tire & Equipment Division
Department TW-548
Akron 18, Ohio

Please send me:
- ☐ Additional information on your Tire and Wheel Analysis Plan
- ☐ Free copy of "Industrial Tire Guidebook"
- ☐ Free copy of "How to Get Extra Service out of Solid Industrial Tires"

Name_____
Company_____
Street_____
City_____ Zone____ State_____



Traveloader... revolutionizes long load handling!

Here at last is a practical answer to the awkward problems of yard handling and particularly those nightmarish long loads. Traveloader combines the unique ability to pick up, carry and stack long, unwieldy or multiple pallet loads —indoors or out. Operating over paved or unpaved roadways, it does the job fast, safely, and much cheaper than other equipment.

This one machine, with one operator, replaces two and often three fork trucks, portable cranes or straddle carriers, and does the job better. You save manpower, cost of buying and maintaining other expensive equipment, aisle space, and time. Because Traveloader loads from the side and carries loads lengthwise, it requires much less aisle space than fork trucks.

Unlike a straddle carrier, this new machine can stack up to 12 feet high. And when traveling, the load is nested safely aboard the Traveloader's deck, eliminating dangerous dangling and swaying of load, distributing load evenly over four large wheels, and making speeds up to 30 MPH practical and safe.

Write for descriptive bulletin No. 1360.

ONLY TRAVELOADER

Picks up like a *straddle* truck • Delivers like a *highway* truck • Stacks like a *fork* truck

THE BAKER-RAULANG COMPANY

1218 WEST 80th STREET • CLEVELAND 2, OHIO

Baker handling equipment

A subsidiary of Otis Elevator Company

514

MARCHANT GOES AUTOMATIC IN PLATING

Udylite Automatic Plating Machine Brings Big Savings to Calculator Maker

The same benefits Marchant Calculators, Inc., enjoy from the installation of a Udylite automatic plating machine can be yours—and for only a modest capital investment.

Better process control, reduction in operating and maintenance costs and improved work quality are the result of Marchant's installation of a Udylite Junior Full Automatic. In addition, they are now experiencing better ventilation, better and safer working conditions, manufacturing control with built-in instrumentation, greatly reduced materials handling and a minimum of rejects.

When the time came to install new plating facilities for their expanding business, Marchant naturally turned to Udylite. After a study of the Marchant problem Udylite engineers recommended the Udylite Junior with an automatic load and unload conveyor for the cadmium plating to fine tolerances of the many parts of the Marchant Calculator.

And so, another business friendship has been formed.

We at Udylite can help you improve quality and save money in your metal finishing operations. For quick response fill in the coupon below.

WORLD'S LARGEST PLATING SUPPLIER

We are interested in Udylite Automatic Equipment for our metal finishing operations. Have your salesman call.

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CITY STATE

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

added feature costs nothing because it is done with stock type by the box manufacturer.

Gerald S. Wilson
The Wilson Rubber Co.
Canton, Ohio

► **FACTORY welcomes ideas like this one, is glad to pass them on to its readers—ED.**

MORE INFORMATION WANTED

Sir:

I read your article entitled "Hot Jobs Will Be Cool Jobs" (FACTORY, Aug. 1955, p. 76) with enthusiasm. This appears to be a revolutionary method for air conditioning in extremely hot areas.

I would appreciate it very much if you could provide me with the names and addresses of firms that specialize in reflection-type clothing and reflection facial creams.

S. A. McNabb
Supt., Industrial Engineering
Westvaco Chlor-Alkali Division
Food Machinery & Chemical Corp.
South Carleston, W. Va.

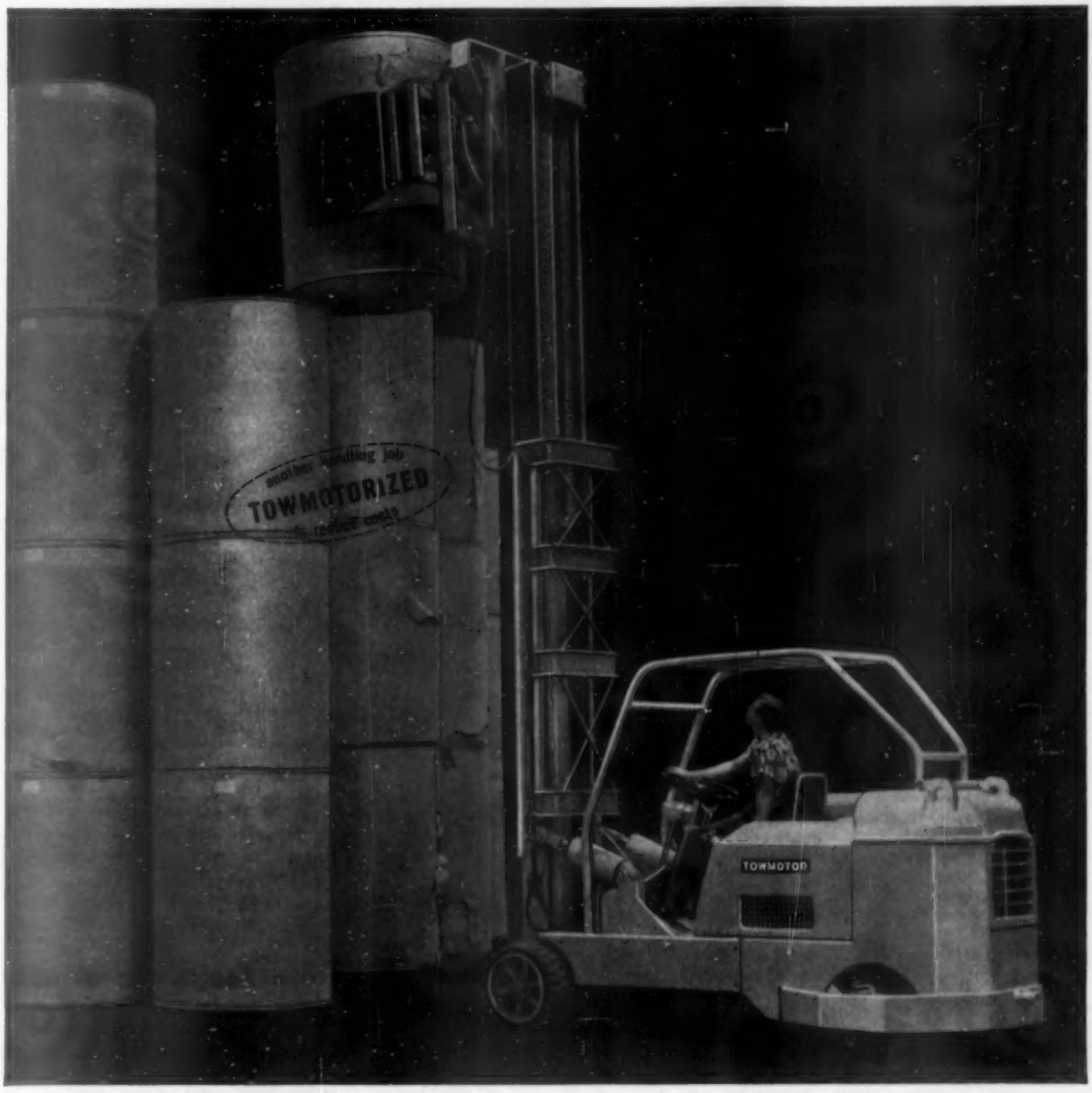
► **FACTORY editors are always happy to provide readers with information about suppliers and manufacturers whenever they can. Just write to The Editor.**

FRIENDLY READER

Sir:

I have been an avid reader of your articles on maintenance for many years and find these articles extremely helpful in developing a maintenance program for our Pearl Harbor Naval Shipyard.

I am master mechanic of the tool shop and am responsible for maintenance and repair of all machinery and machine tools, portable power equipment (such as welding machines, compressors, generators, pumps, etc.) and repair and maintenance accountability of portable power tools (portable grinders, electric and pneumatic drills, riveting machines, portable saws). I also operate 21 tool cribs throughout the



Towmotor with upending roll clamp accessory, stacks 7000 pound liner board roll 17 feet high.

TOWMOTOR makes new plant really modern!

It's not so ridiculous as it might sound! No plant—new or not so new—is truly modern unless materials are "mass handled" the Towmotor way. You can eliminate wasted time and inefficiency in every phase of your manufacturing, receiving, storage, processing and shipping. The savings made with Towmotor are immediate and substantial. You can apply them to your own business. Write for a Towmotor Certified Job Study on your own industry. TOWMOTOR CORPORATION, Div. 512, 1226 E. 152nd St., Cleveland 10, Ohio.

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THE ONE-MAN-GANG ®

FORK LIFT TRUCKS
and TRACTORS SINCE 1919

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Why REZNOR sells 1 out of every 2 Gas Unit Heaters

Reznor leads in QUALITY

One out of every 2! Such complete domination of a market shared by more than 100 producers can't be an accident. Reznor achieved this leadership by building a better unit heater. An alert, aggressive product development program keeps Reznor ahead of the field. And the highest standards of craftsmanship and materials insure to every Reznor user the full advantages of Reznor's "years-ahead" engineering.

Reznor offers the best PRICE

The best heater at the lowest price? No, it isn't possible. Prices on Reznor heaters are comparable to those of the best competitive units . . . higher than those of some inferior units. But the economies of mass production enable Reznor to build a better heater for the price. Wise buyers take advantage of this to get more heater value, dollar for dollar, from Reznor than any other manufacturer can afford to offer.

Reznor is first in KNOW-HOW

Gas unit heaters are a specialty, not just a side line, with Reznor. Every emphasis is given to the development of more efficient gas-fired space heaters for business and industry. This determination to do one thing well means that every possible improvement will be fully explored and exploited—never sidetracked for other projects or products.

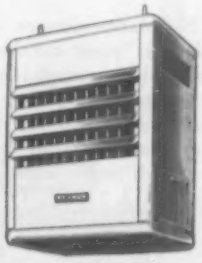
And because Reznor sells more, many more, gas unit heaters than any other manufacturer, Reznor knows more about gas unit heating. If your Reznor representative or distributor doesn't have the answer you need, he can get it. Somebody somewhere in the Reznor organization will have the solution—proven by experience.

Reznor is tops in AVAILABILITY

Reznor has distributors in more than 300 cities. Most of them maintain complete warehouse stocks. Wherever you are, you can be sure that the Reznor units you need will be available when and where you need them.

And wherever you are, if it's information you need, your Reznor distributor is as close as your telephone—usually for the price of a local call. If you don't find a Reznor listing under "Heaters-Unit" in the classified pages of your telephone directory, please let us know. We'll give you the name and address of your nearest representative and distributor.

REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT HEATERS



Reznor Manufacturing Co., 67 Union St., Mercer, Pa.

Begins on page 3

shipyard and my tool-grinding department conditions all edged tools within the shipyard.

The work for which I am responsible is under the production department. We have created, over a period of years, a maintenance control program of which we are justly very proud. This program has been endorsed by the Bureau of Ships and we are now engaged in formulating plans whereby the program we have developed will be installed in all U. S. Naval shipyards.

Giving credit where credit is due, many of the ideas incorporated in our program stem from your very good publication. I am not at liberty at present to outline our program but I will seek permission from the Bureau of Ships to refer details of our program to you. Any comments you may have on our developments will be appreciated.

My compliments again for your very fine magazine.

Adrian G. Sira
Master Mechanic
Pearl Harbor Naval Shipyard

► We're very happy to have Reader Sira's letter and we'll welcome the opportunity to comment on the program of a man who's the taxpayers' friend—ED.

MORE ABOUT THE FLOODS

Sir:

You might be interested in the comments of our own engineering department and plant relative to hoists and cranes (one of many kinds of equipment covered in FACTORY's special bulletin, "What to Do After the Flood," Aug. 1955). I quote their comments:

Small chain hoists—Remove gear cover, flush bearings and gears, relubricate thoroughly. Remove hand wheel and clean brake parts and brake thread of grit. Relubricate leather linings. Dry and clean automobile-type brake linings on new type hoists. *Caution:* Brake linings, if wet, are erratic and may drop the load, be difficult to lower. So stay clear of the load.

Electric hoists—Tear down completely and dry out components. Re-

now.....
VEEDER-ROOT
gives you

instant "push-button" resetting

Just press the easy-acting lever on this Quick-Reset Ratchet Counter . . . *and all 4 figures reset to zero as instantly as though you used a push-button.* This saves time and speeds work on short machine runs, inspection and many other jobs. Counter is compact . . . 2.69″ long, 1.44″ high, 1.29″ wide. The 4 white-on-black figures are .166″ high. You can order it (Series 1126) from stock right now . . . just like scores of other Veeder-Root Counters for manual, mechanical and electrical operation in every field from electronics to atomics.

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EVERYONE CAN COUNT ON
VEEDER-ROOT
"THE NAME THAT COUNTS"

"Our Janitrols save us over 40% in fuel costs"

Says Mr. C. J. Mayle, President, Fremont Tool & Die Co., Fremont, Ohio, comparing Janitrol Unit Heaters with oil-fired steam heat used previously.

Here's how Janitrol engineers and equipment solved all of Mr. Mayle's tough heating problems.

● Bothersome drafts, caused by the exhaust of heated air in the removal of abrasive dusts, were eliminated by bringing in outside air, "tempered" by Janitrol DUCT Heaters. The Dura-tube heat tubes in the DUCT units minimized the corrosive effects of condensation caused by the cold outside air.

● The 'Surface' Industrial Processing Furnaces, "big brothers" to the Janitrol line, made warm spots in the shop area. Individual Janitrol Unit Heaters, with separate thermostats, provided uniform, zoned comfort throughout.

● Economical year 'round office comfort was obtained by using the same duct system for summer cooling and winter heating. The plant is ventilated in summer by the unit heater blowers.

These Janitrol Units temper the outside air which is brought in to replace the heated air exhausted in abrasive dust removal.

It is not only the superiority of Janitrol design, but also the training of its engineer-representatives who integrate and balance this equipment to meet your problem. For new, or remodeling advice, send these problems to us. No obligation.

®Janitrol Gas-Fired
UNIT HEATERS

DIVISION OF SURFACE COMBUSTION CORPORATION
400 DUBLIN AVE., COLUMBUS 16, OHIO

MAKERS OF SURFACE INDUSTRIAL FURNACES AND KATHABAR HUMIDITY CONDITIONING

Begins on page 3

move electric coils and motors, vacuum bake them as if after rewinding. Unless coils are dry, insulation is likely to break down and destroy the equipment. Wiring of hoists should be completely dried, insulation checked.

Overhead traveling cranes—Tear down gear housings, clean them of sludge deposits and water, then relubricate them.

Ball or roller-bearing pillow blocks, and wheel bearings—Relubricate by using fresh grease to squeeze out both the old grease and water emulsion.

Electrical components — Same treatment as for electric hoists above.

Crane brakes, hoist brakes—Dry thoroughly. Follow instructions of manufacturer.

Cables—Relubricate them with cable compound.

Whether the above will help you in any reprints of your booklet we don't know, but inasmuch as you are doing so much for people, we thought you might be interested.

S. J. Woodworth
Wright Hoist Division
American Chain & Cable Co., Inc.
York, Pa.

Sir:

We have reviewed your booklet "What to Do After the Flood" and find it has very useful information. We would appreciate your sending us 12 copies.

Norman D. Schulze
Plant Engineer
Sprague Electric Co.
North Adams, Mass.

► **We've had a flood of requests for FACTORY's 28-page flood booklet. Reprints are still available. Price: 25¢ per copy; quantity prices quoted on request. Address The Editor, FACTORY, 330 West 42nd St., New York 36.—ED.**

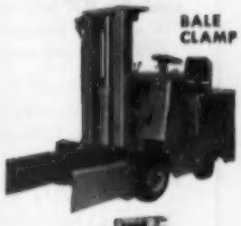
CLEAN AIR — OR ELSE

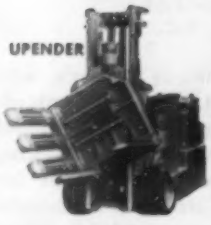
Sir:

I have just read "Now It's Clean Air—or Else" (FACTORY, Aug. 1955, p. 97) . . . This article is, in my opinion, the finest and most

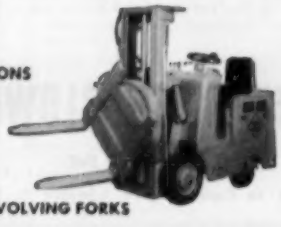
GIANT WITH 19 HANDS

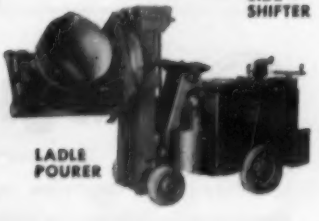
One Elwell-Parker gives you the strength of a giant—more muscle power than 10 men. And giants' hands could not be more dextrous than the ingenious fork truck with attachments illustrated. They are a product of Elwell-Parker's 45 years' experience, gained while solving scores of unusual handling problems. Truly, Elwell-Parkers can be made to do almost anything but think—our engineers do that! The Elwell-Parker Electric Company, 4031 St. Clair Avenue, Cleveland 3, Ohio.

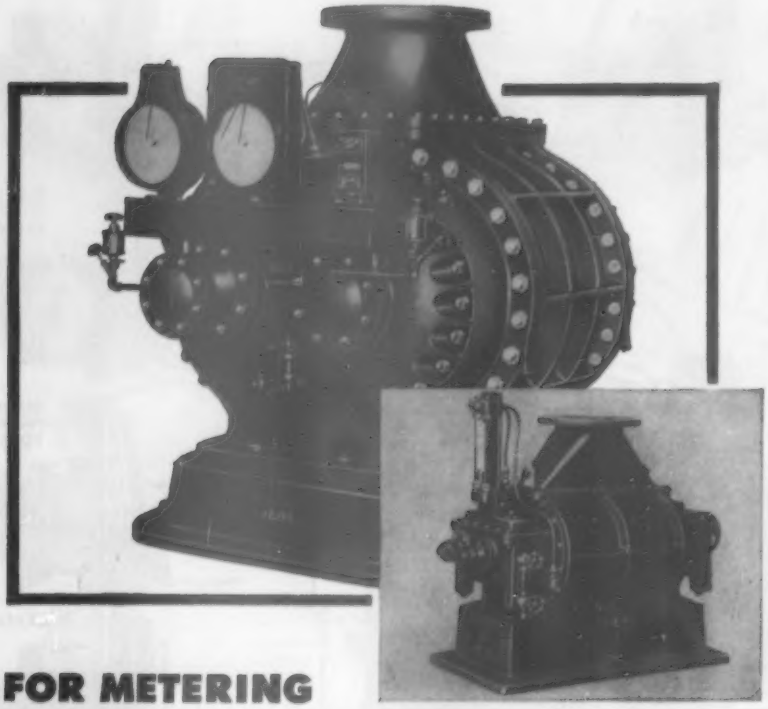




ELPAR
INDUSTRIAL TRUCKS







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5,000 cfh or a MILLION

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Look for R-C plur-ability in all your equipment to handle gas and air

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Spiraxial® Compressors

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Positive Displacement Vacuum Pumps and Meters

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Ask for detailed bulletins on any R-C product—or write us your needs.

Packed into every Roots-Connersville Positive Displacement Gas Meter are important values which mean *"plur-ability."* Summed up, they give you accuracy unmatched by any other type—that endures over many years of use. Maintenance is practically unknown, with no vanes, valves, or small parts. Compactness saves space and foundation cost. Capacities, pressures and overload ability fit your most exacting needs. Wherever you need to measure gas from 5,000 cfh to a million, you can trust the staying qualities of R-C Positive Displacement Meters. Ask for specification details in Bulletin M-152.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

1255 Central Ave., Connersville, Indiana. In Canada—629 Adelaide St. W., Toronto, Ont.

practical non-technical presentation I have seen on the problem of industrial air pollution and what can be done about it. Your editors are to be congratulated for bringing this subject, so often confused for the layman, down to earth. I wish I could get a copy of this article into the hands of management in every manufacturing plant in the City of New York.

Leonard Greenburg, M.D.
Commissioner
Department of Air Pollution Control
New York City

OOPS!

Sir:

Your article "Pre-Testing Dream-Plant Ideas" (FACTORY, Oct. 1955, p. 123) advances some good ideas for companies interested in expanding or improving their plants . . .

But the article states that this model was built over a period of 18 months at a cost of $4600. We would like to know what makes up this cost. If only one man worked on this model for 18 months and was paid as much as $225 per month, you would equal the cost of the model, with no overhead or material cost shown. The article refers to a group that built the model and to visits to over 20 major plants (plus some small ones) to pick up ideas and incorporate them. So it's hard to see just how the cost of the model was only $4600.

Owen B. Callihan
Burton Rogers—Technical
Training Aids, Inc., Tulsa

► **The cost figure is Carrier's, who built the model. But the length-of-time figure is our mistake. It should be 1½ months, not 18. Somehow, when we processed the article for our printer, Carrier's 1½ months became 1½ years, and 1½ years then became 18 months. Homer nodded—ED.**

Readers may address any letters, comments, and questions to The Editor, FACTORY, 330 West 42nd St., New York 36.

TURN AISLE SPACE INTO SAVINGS!

Ultra Compact, Sharp Turning

Automatic ELECTRIC TRUCKS

Need less room for maneuvering, ...give more space for storage

Pictured here are four of a number of *Automatic Electric Trucks* specially engineered for efficient materials handling in minimum space. Converting aisle space into storage space is, however, but one of many benefits possible from models best suited to your requirements. Why not get all the facts about what these versatile trucks can do for you? Also learn how you can lease the ones you need without 1¢ of capital investment or purchase on convenient budget plan. Send coupon below for complete facts.

Retractable Mast **TRANSVEYOR** with fully retractable mast saves working space equal to length of load.

Low-lift type **TRANSVEYOR** needs up to 50% less aisle space than counterweighted trucks.

The versatile **DOCKER** provides efficient heavy duty service in cramped quarters for a wide variety of needs.

The featherweight **SKYLIFT** ...an agile and efficient "work horse" where space is at a premium.

MAIL COUPON TODAY FOR FULL DETAILS

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Please rush me FREE specification folders on Automatic Trucks checked below:

☐ RETRACTABLE MAST TRANSVEYOR ☐ LOW-LIFT TRANSVEYOR
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Include new data folder on the Automatic "EARN-ITS-OWN-WAY" Plan.

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WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS

Eye Accident Costs Go Down when AO† Safety Glasses like these Go On!

FS100
(METAL)

FS500
(PLASTIC)

The workers illustrated are wearing AO's NEW *safety* glasses. Because these glasses are comfortable and good looking (as well as of the highest quality) they will be willingly worn. BECAUSE THEY WILL BE WILLINGLY WORN THEY WILL PAY FOR THEMSELVES *MANY TIMES OVER* IN THE EYE ACCIDENT COSTS THEY SAVE.

Ask an AO Safety Representative to show you how little *quality* protection costs. Or write American Optical Company, 5312 Vision Park, Southbridge, Massachusetts, for booklet.

NOTE: Male worker is wearing the new AO metal goggle. Lady is wearing the new AO plastic goggle.

Always insist on AO Trademarked Lenses and Frames

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

†T.M. REG. BY AMERICAN OPTICAL COMPANY

Pittsburgh COLOR DYNAMICS®
increases productive efficiency in famous aircraft plant

Properly engineered color plan throughout plants of The Martin Company provides better working conditions that increase quality and quantity of output and improve spirit and enthusiasm of workers.

BETTER seeing conditions increase productive efficiency. More pleasing work areas improve the spirits and enthusiasm of supervisory and hourly personnel alike! These are the benefits resulting from the use of Pittsburgh COLOR DYNAMICS in The Martin Company, Baltimore, Maryland, world-famous pioneer of the aviation industry.

These huge factories, with five million square feet of floor space, produce many types of military aircraft as well as tactical missiles, rockets and numerous other items for the armed services.

The new color plan for these plants was carefully chosen according to the principles of COLOR DYNAMICS.

Colors were selected for interior walls and ceilings to raise the light level in all working areas. Stationary as well as moving parts of machines were given colors that permit the operator to focus his attention on his task with less eye strain. Safety colors on motorized equipment and traffic lanes have reduced danger of time-loss accidents.

The Martin Company's satisfaction with COLOR DYNAMICS is best summarized by G. T. Willey, Vice-President in charge of manufacturing:

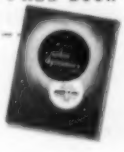
"We believe we have successfully attained our objectives with COLOR DYNAMICS. Both quality and quantity of our output have increased. The improved surroundings have raised morale among our working force. The pride our employees take in their environment is reflected in their eagerness to keep work areas clean, thus simplifying housekeeping.

"The colorless and uninspiring whites and grays we had collected dirt easily. We believe our present colors will cost us less to maintain. Thus the additional benefits we derive from COLOR DYNAMICS are a highly gratifying plus value."

GET AN ENGINEERED COLOR STUDY OF YOUR PLANT—FREE!

● Send for our free book which explains simply and clearly what COLOR DYNAMICS is and how to apply its principles. It contains scores of practical ideas. Better still, call your nearest Pittsburgh Plate Glass Company branch and ask to have a representative make a comprehensive engineered color study of your plant—without cost or obligation. Or mail this coupon.

Send for a Copy of This FREE Book



Pittsburgh Plate Glass Co., Paint Div.,
Department FMM-125, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

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PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

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American Blower
Gýrol Fluid Drives
offer you

Adjustable speed over a 5 to 1 speed range

Think of the power and maintenance savings you'd gain from your equipment if you could eliminate special motors and expensive starting controls, yet still have an adjustable speed drive with a wide speed range.

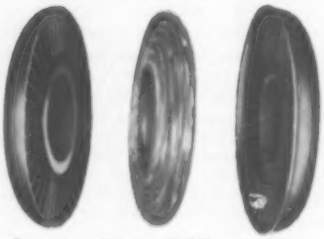
You get this advantage with American Blower Gýrol Fluid Drives — plus the additional benefits of no-load starting, shock absorption, automatic or manual acceleration control and quiet operation.

The standard Gýrol Fluid Drive line includes constant-speed and adjustable-speed units — from fractional horsepower to 12,000 hp and speeds to 3600 rpm. Your nearest American Blower Branch Office has full information. Why not give them a call.

Typical Applications

PUMPS, AGITATORS, MIXERS
CONVEYORS, CABLE & ROPE MACH'Y
FANS AND BLOWERS
CENTRIFUGAL COMPRESSORS
PAPER AND PRINTING MACH'Y
TEXTILE MACH'Y

Principle of operation of Gýrol Fluid Drives



Runner Vortex of Oil Impeller

Operates on hydro-kinetic principle, using vortex of oil to transmit power from driving to driven machinery. Power is transmitted smoothly, evenly, efficiently without shock. Fluid Drive provides a simplicity of design and a flexibility of operation no other method of power transmission offers – plus an inherent safety factor.

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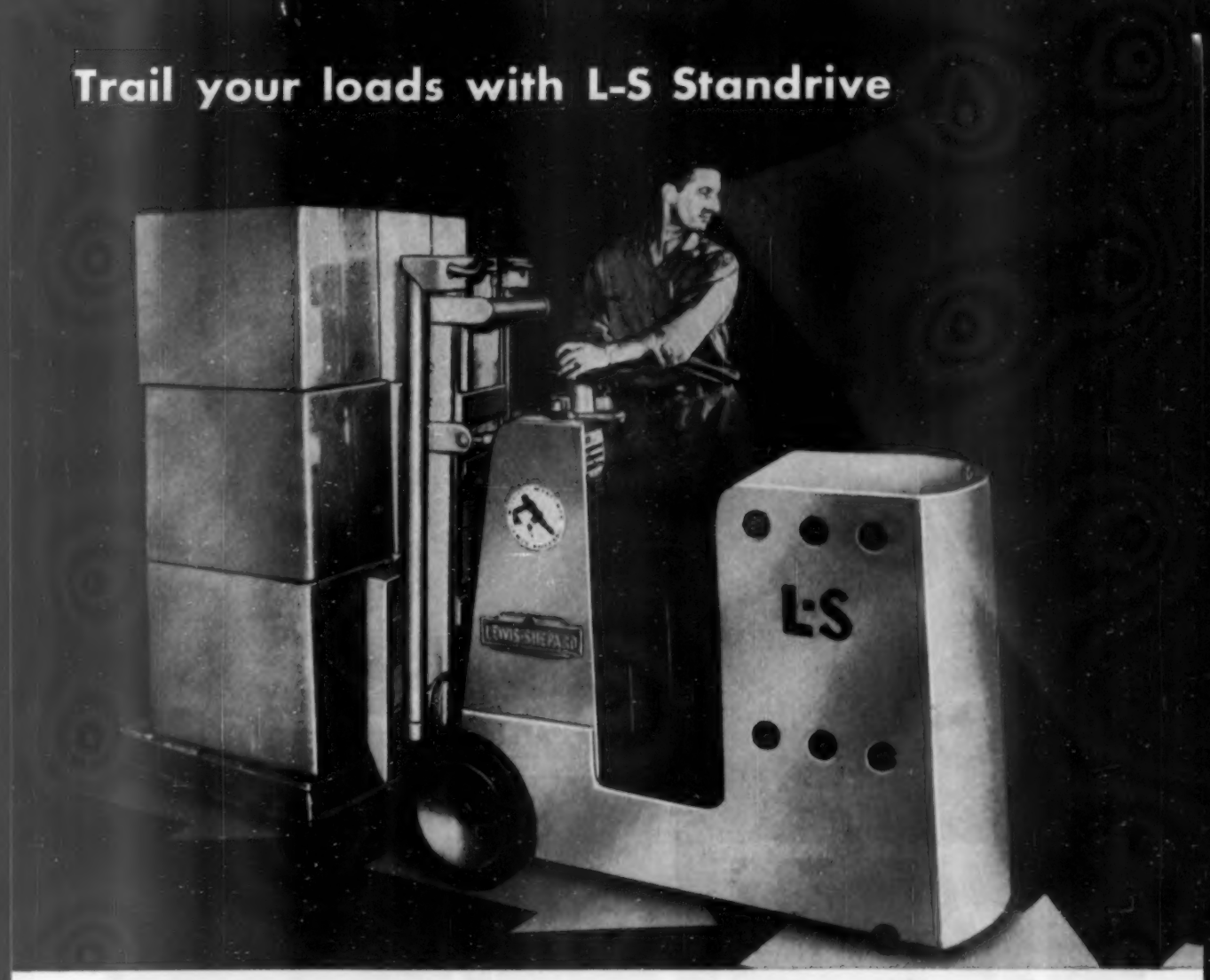
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE
DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Trail your loads with L-S Standrive



you see better, work safer, work faster

Good materials handling practice requires that you trail loads for both safety and efficiency. Yet only L-S Master Trucks with "Standrive" are designed *specifically for* trailing loads.

Make this simple test, prove for yourself the advantages of "Standrive" design:

From a sitting position, with both hands on your desk, try turning around to get a clear view of everything behind you. Difficult, isn't it?

Now do the same thing from a standing position. Notice how much easier it is?

That's how "Standrive" improves visibility for trailing loads safely . . . keeps operators alert and in full command of the truck.

Dependable L-S Master Trucks are ordered and reordered by "blue chip" companies. Recent reorders include:

Rubber Co.	28 L-S in use — reordered 6
Electronics Mfg. Co.	297 L-S in use — reordered 35
Motor Car Co.	45 L-S in use — reordered 5
Glass Mfg. Co.	22 L-S in use — reordered 9

"Standrive" also lets you work faster . . . no time wasted turning truck around. Just drive forks under the load . . . lift . . . and trail it away.

In addition to exclusive "Standrive", Lewis-Shepard Electrics offer you such quality features as "lubricated for life" design . . . never need greasing; highly efficient L-S hydraulic system; quick, positive magnetic controls; gear drive . . . no chains or clutches to wear out.

Why not write for all the facts? Use the convenient coupon below.

MULTIPLY MANPOWER · LEWIS-SHEPARD

LEWIS-SHEPARD

1512 Walnut St., Watertown 72, Mass.

"The Master" line

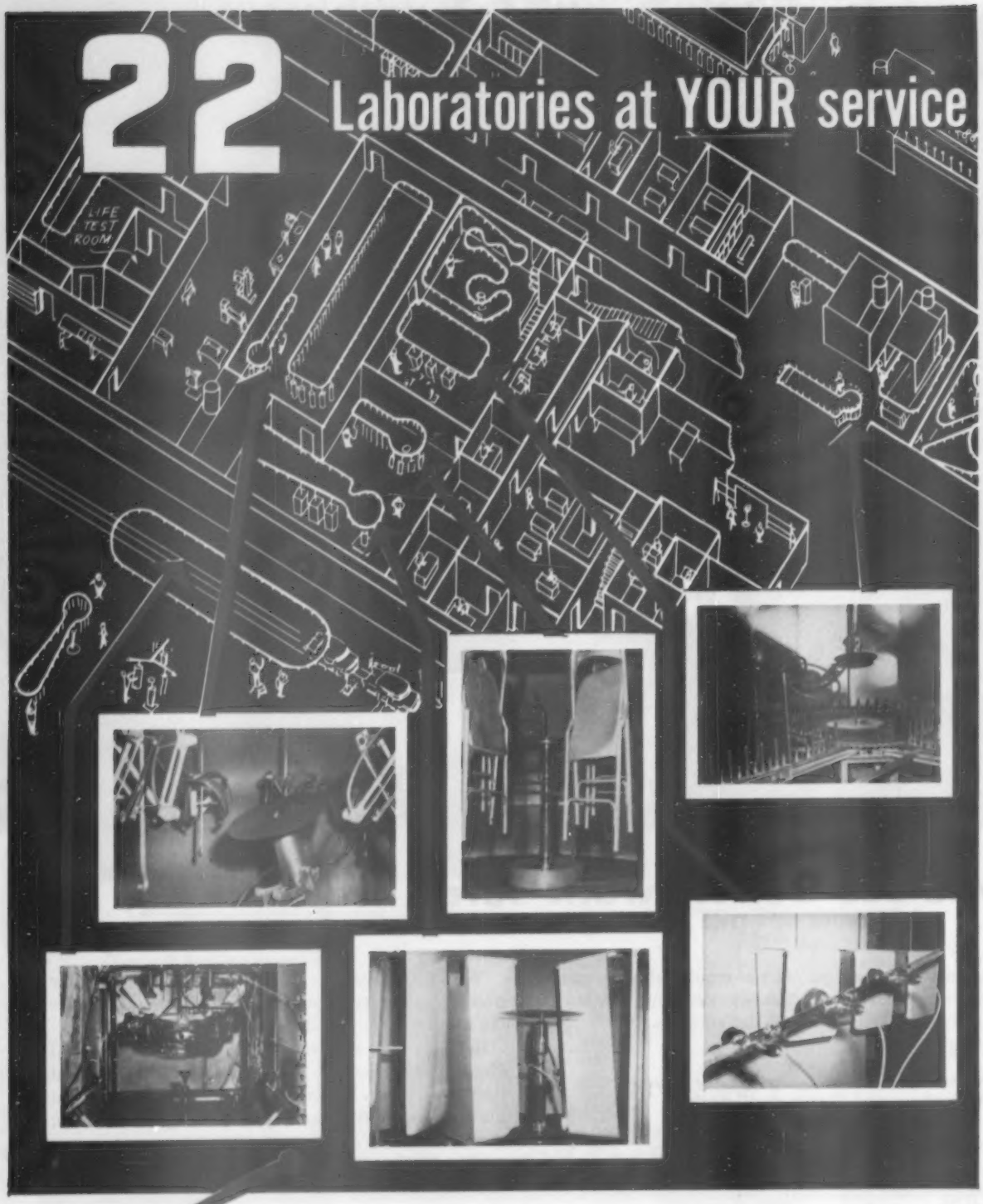
Please send

- ☐ Catalog #32 showing L-S Trucks with "Standrive"
- ☐ Bulletin on Leasing, Renting, and Financing Facilities

Name _____

Company _____

Address _____



YOUR JOB, LIKE THESE SHOWN ABOVE, WILL BE TEST PROVEN

under simulated production conditions to determine cost-saving benefits and other advantages. Ransburg also maintains other test facilities in Los Angeles, London, England; Bad Hersfeld, Germany; Paris, France and Sydney, Australia.

to prove the painting of YOUR products with

RANSBURG

Electrostatic Painting Processes

Let us make laboratory tests and prove the advantages and cost-saving benefits of painting YOUR products AUTOMATICALLY with one of the Ransburg Electro-Spray Processes.

GET THE FACTS . . . IT COSTS YOU NOTHING!

STEP BY STEP—HERE'S WHAT YOU GET...

- Survey of your plant by Ransburg's experienced field engineers, including savings estimate.
- Lab painting demonstration of your products, using equipment closely simulating your own production conditions.
- Accurate measurements of paint film thickness.
- Engineering report of detailed tests to determine paint and labor savings.
- Coated samples of your job, lab production photos, and even movies if desired.
- Detailed drawings of equipment and workholder.

All of the above without obligation to you. And, before equipment is installed you receive detailed, pre-installation instructions. Too, a well-qualified, experienced engineer supervises installation and trains your operator on the job. Ransburg offers continuing laboratory and field service to help you with any of your finishing operations.

Ransburg

ELECTRO-COATING CORP.
Indianapolis 7, Indiana

● **First,** Ransburg sales engineers will make a survey in your plant to check the possibilities of using Electrostatic Spray Painting on your products. Next, you will send samples of your unpainted products—with paint—to the Ransburg laboratories in Indianapolis.

Here, the technical staff takes over. The Ransburg Engineering staff—which includes PH.D's and Masters in Physics, Science, Electrical, Mechanical and Chemical Engineering—makes a complete study of your job. Not only do they have the necessary academic training, but they have the "know how" gained from years of actual experience in the field. Ransburg, you know, was the pioneer in Electrostatic Spray Painting 15 years ago. Engineers and well-qualified technicians have at their disposal every facility for conducting complete tests, simulating your own production conditions. They'll decide which type conveyor is best suited for your job. (There's a conveyorized lab set-up—22 in all—to handle products ranging in size from automobile bodies and chassis to small components, such as window hardware.) They'll design workholders, if necessary, and determine exactly how your job can be run to your best advantage. Details, such as fixture spacing, will be worked out too.

After preliminary studies and tests, you are invited to Indianapolis to see your job run in the lab. If you wish, photos and even movies of your test run can be made and furnished for your own production people to study. You see first-hand what Ransburg Electrostatic Spray Painting can do for you in your own plant.

YOU GET PAINT AND LABOR SAVINGS

Paint usage is accurately measured during the demonstration. The Ransburg No. 2 Process will provide savings up to five times the paint mileage of hand spray. And, one unit can do the work of many hand sprayers. You will see the improved, uniform quality of the work . . . you'll know what kind of increased production to expect, and you can recognize labor savings. ALL OF THIS WITHOUT OBLIGATION.

Ransburg service doesn't end there. After the equipment is installed in your plant—with our supervisory help—we will train your operator and continue to work with your finishing department. Our technically-trained field service engineers are always available to assist with any of your finishing problems.

Briefly, that's our story. Now it's your move. Call or write.

HOW MUCH ARE YOUR FLOORS COSTING YOU, MR. PLANT MANAGER?

When you add the cost per square foot for repairing your present factory floors to the cost of cleaning them, does the total seem too high?

Probably—because most factory floors of wood or concrete are costly to repair—and are expensive and difficult to clean and keep clean.

Vina-Lux is a tough, greaseproof vinyl asbestos floor tile designed to out-perform wood and concrete factory floor surfaces. It can be installed quickly and easily over any smooth wood or concrete floor and it can be used as soon as it is installed. Vina-Lux can mean real savings per square foot in *your* plant.

Why? Because Vina-Lux is made largely of vinyl resin and asbestos fibre. These two extremely durable materials plus pigment and filler are combined under high heat and pressure to produce a smooth-surfaced flexible tile—easy to install, easy to clean, and resistant to those abuses common in manufacturing plants.

Vina-Lux is not softened or affected by most greases, oils and alkalis. Its tough, resilient structure is tightly interlaced so that rolling friction from material handling trucks does not beat it apart. Dropped tools, heavy usage do not splinter or abrade away this modern answer to factory floor traffic.

Twenty attractive colors, many of them with exceptional light reflectance, mean beauty as well as durability when you use Vina-Lux. Why not investigate this new approach to factory floors? Ask us to have a qualified representative call and discuss your flooring problems with you. There is no obligation, of course.

UVALDE ROCK ASPHALT CO.

FROST BANK BUILDING • SAN ANTONIO, TEXAS

Makers of AZROCK • AZPHLEX • VINA-LUX • DURACO

AZROCK FLOORING PRODUCTS

"Azrock Makes Fine Floors"

New Money-Saving Airpower Anywhere in the Plant

Compact... Lightweight... Air Cooled

Le Roi Stationary Compressors are easily installed... anywhere

Take full advantage of every space in your plant where the economies of airpower can increase production and lower costs. How? By using Le Roi's two-stage, air-cooled stationary compressors that require a minimum of space, and are easy to install.

They're compact and lightweight. Moreover, these Le Roi compressors require no cooling water, eliminating the need for expensive space-eating pipes. There's no danger of freeze-ups or overheating from lack of liquid coolants. Only minimum attention by an operator is needed.

The new three cylinder 50S2, and six cylinder 75S2 and 100S2 compressors are balance-designed, reducing vibration and noise to a minimum. Available in 50, 75, and 100-hp sizes producing 210, 340, and 450-cfm capacities at 125 lbs. pressure, these new Le Roi airpower units offer low-cost operation, low-cost installation, and low-cost maintenance advantages for a wide range of needs.

For years Westinghouse compressors were the national favorite in the ½ to 40-hp size range. With the three new Le Roi sizes, an even greater range of dependable airpower is yours — up to 100 hp.

Write today for complete literature describing Le Roi's dependable, low-cost air supply.

LE ROI Division of Westinghouse Air Brake Co.

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Distributors in all principal cities

How Lionel got the inside

A HOLIDAY SPECIAL BY MR. FRIENDLY

In just 5 Christmases, American Mutual Safety Engineers have helped The Lionel Corporation save $165,995.53 through lower insurance premiums and dividends.

Any male American who's ever needled Santa for a model train knows the name Lionel. For the last 15 of its 50-plus years on the pike, The Lionel Corporation has been insured with American Mutual.* Cooperation between manufacturer and insurance company has resulted in savings that have been anything but miniature—amounting to over 165 thousand dollars *in the last 5 years alone!* Such carloads of savings reflect Lionel's forward-looking management policy. Now branching into other fields, including manufacture of photographic and fishing equipment and defense items, The Lionel Corporation, aided by American Mutual's special service, has developed a safety program which protects its 3,000 employees—and lowers operating costs.

If you're interested in a similar service—one which can put you on the right track to big savings and higher employee morale, write: American Mutual Liability Insurance Company, Dept. F-131, 142 Berkeley Street, Boston 16, Mass.

AMERICAN MUTUAL

**Now written by our associate, American Policyholders' Insurance Company.*

Service from 77 fully staffed offices!

Savings from regular substantial dividends!

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track to savings—

right now...

Swaged Hose Assembly Service

....AT YOUR WEATHERHEAD

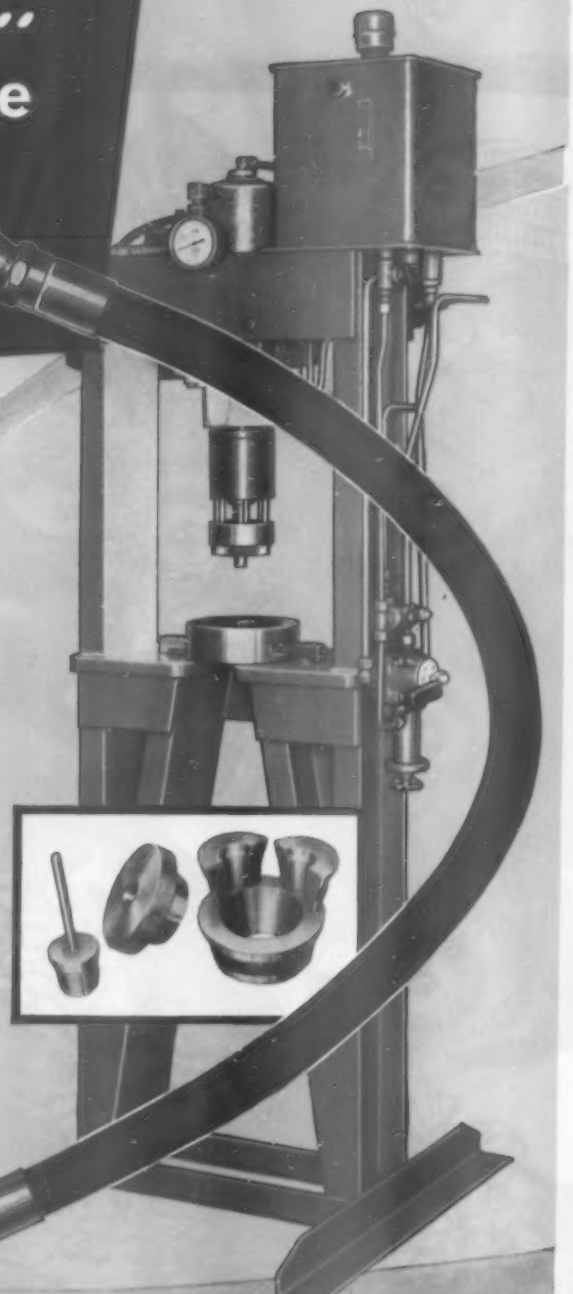
DISTRIBUTOR

ANY HOSE ASSEMBLY MADE IN 3 MINUTES

Right in His Own Service Shop

Now, for the first time, your Weatherhead distributor offers you complete swaged hose assembly service right in his own shop. No waiting for shipments of factory-finished hose assemblies. No need for costly downtime and delay. Equipped with the new Weatherhead swaging press and the complete line of Weatherhead hydraulic hose and hose ends, your distributor is prepared to supply you with any size, type and length hose assembly at once.

Wherever you are, whatever your need, there is a Weatherhead distributor strategically located to give you immediate stand-by swaged hose assembly service.



WEATHERHEAD LEADS THE WAY

now available

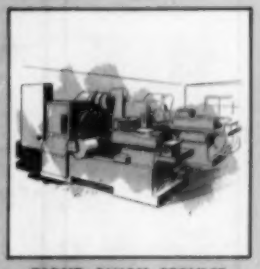
at Weatherhead Distributors

ON-THE-SPOT SWAGING SERVICE FOR HYDRAULIC HOSE ASSEMBLIES

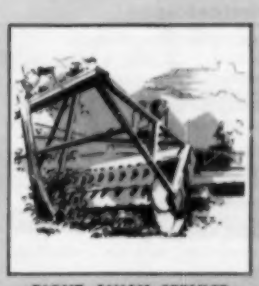
Any Size . . . Any Type . . . Any Length . . .

The complete range of sizes from ¼" to 2" I.D. in the Weatherhead full line of hose and hose ends, eliminates any delay in completing the job. Be assured of safe, trouble-free service by specifying Weatherhead for all your hose assembly needs. The Weatherhead complete line of fittings and hose is as near as your phone. Call your local Weatherhead distributor today for immediate service.

RIGHT AWAY SERVICE
For mining and oil drilling fields.



RIGHT AWAY SERVICE
For all types of manufacturing operations.



RIGHT AWAY SERVICE
For construction and farm machinery.

RIGHT AWAY SERVICE
For hydraulic materials handling equipment.

Turn the page

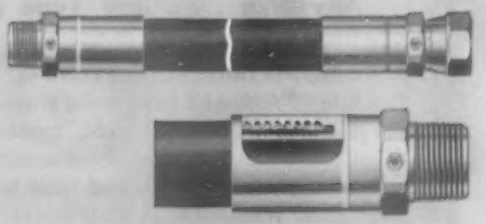
WEATHERHEAD

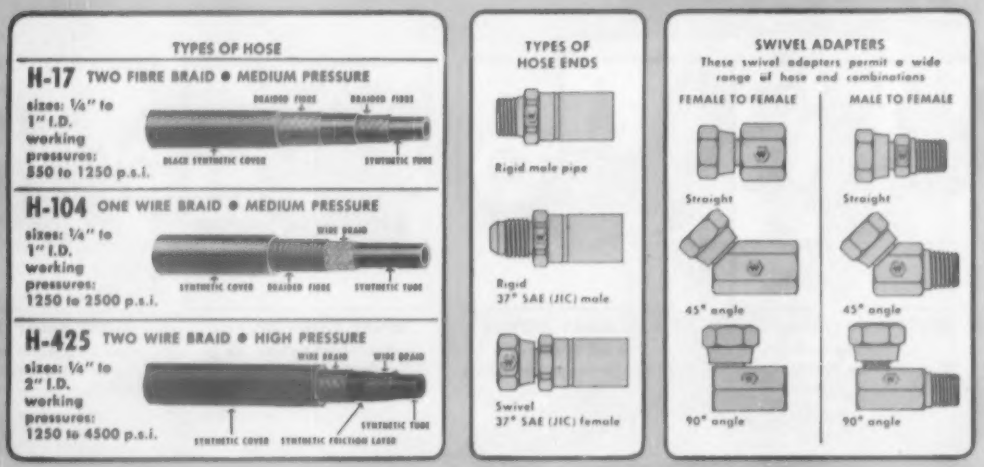
WEATHERHEAD DISTRIBUTORS

Your reliable source for "RIGHT-NOW" Hose Assembly Service

Weatherhead swaged hose assemblies match factory-made assemblies in every respect. They are available in any quantity, length, type or size to meet your needs. Now made-to-order hose assemblies are available at once through your local Weatherhead distributor at no additional cost. Your downtime is cut to a matter of minutes because your order can be made up on Weatherhead swaging equipment right in your Weatherhead distributors own service shop.

Take advantage of your Weatherhead distributor's dependable RIGHT-NOW hose assembly service. Save money. Reduce downtime.





WEATHERHEAD LEADS THE WAY

WEATHERHEAD... your only complete "single-source" Hydraulic Hose and Fitting Line ...FIRST IN COMPONENTS FOR HYDRAULIC SYSTEMS

An INDUSTRIAL HOSE for every need — low, medium-high and high-pressure applications; in complete size ranges to 2" I.D.; suited for any service condition.

REUSABLE HOSE ENDS for fast assembly and positive, leak-proof connections. Rugged construction that cuts costs through repeated use. Designed to insure maximum flow.

ERMETO® reusable hose ends for connecting hose assemblies directly to block or manifold are also available from stock in standard sizes. Specified by major diesel manufacturers for high-pressure fuel injection lines.

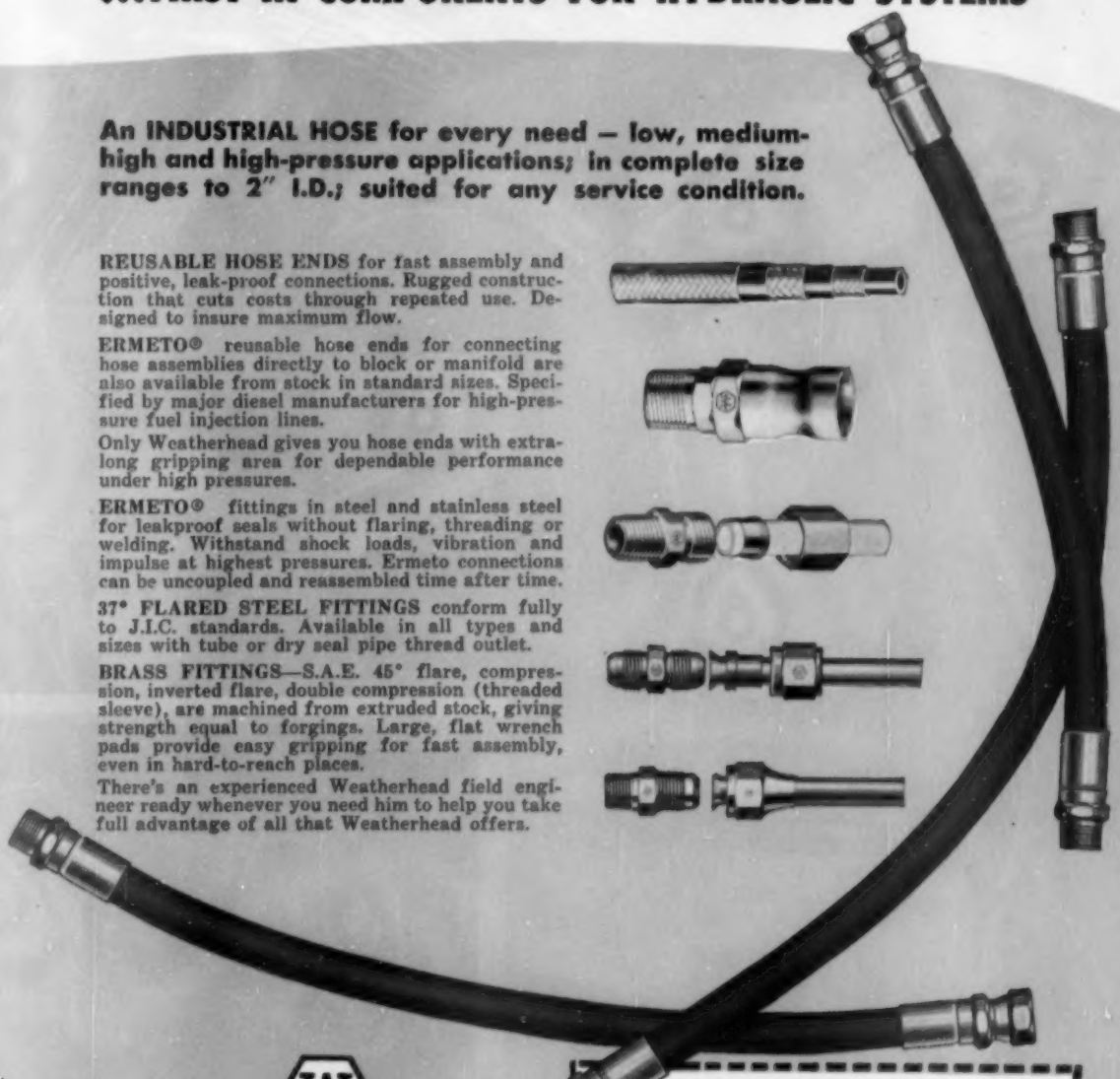
Only Weatherhead gives you hose ends with extra-long gripping area for dependable performance under high pressures.

ERMETO® fittings in steel and stainless steel for leakproof seals without flaring, threading or welding. Withstand shock loads, vibration and impulse at highest pressures. Ermeto connections can be uncoupled and reassembled time after time.

37° FLARED STEEL FITTINGS conform fully to J.I.C. standards. Available in all types and sizes with tube or dry seal pipe thread outlet.

BRASS FITTINGS—S.A.E. 45° flare, compression, inverted flare, double compression (threaded sleeve), are machined from extruded stock, giving strength equal to forgings. Large, flat wrench pads provide easy gripping for fast assembly, even in hard-to-reach places.

There's an experienced Weatherhead field engineer ready whenever you need him to help you take full advantage of all that Weatherhead offers.



THE WEATHERHEAD CO., FORT WAYNE DIVISION
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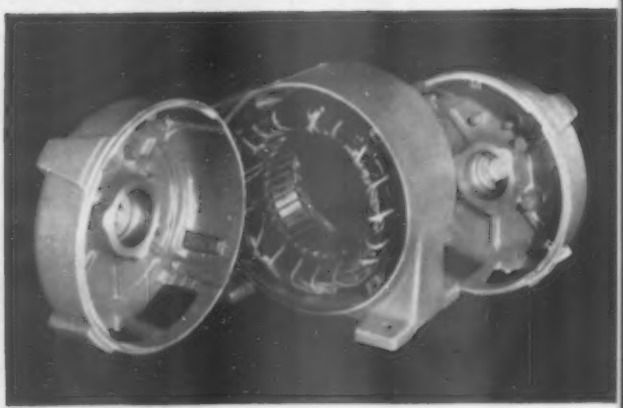
MOTOR FACTS ON INDUSTRY'S
MOST-PREFERRED "POWER PACKAGE"



Electrical System Fact: New fortified insulation includes exclusive Bondar, Bondite and Mylar* for greater protection against the toughest operating conditions.

*Du Pont registered trade-mark

FACT:

The new Life-Line A has stronger insulation than any other motor on the market

Meaning what? Simply that the new Westinghouse Life-Line® "A" motor with new fortified insulation can withstand heavier overloads and operate at higher temperatures than any other motor you can buy.

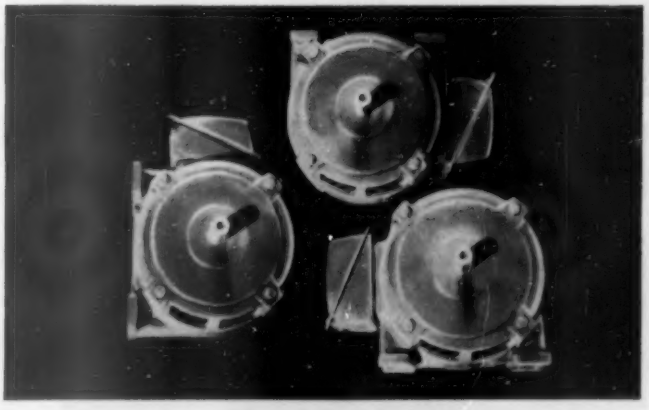
Similar design advances in the mechanical and lubrication systems make Life-Line "A" industry's most preferred motor.

It takes the right combination of *all three systems*—electrical, mechanical and lubrication—to build the best package of power on the market.

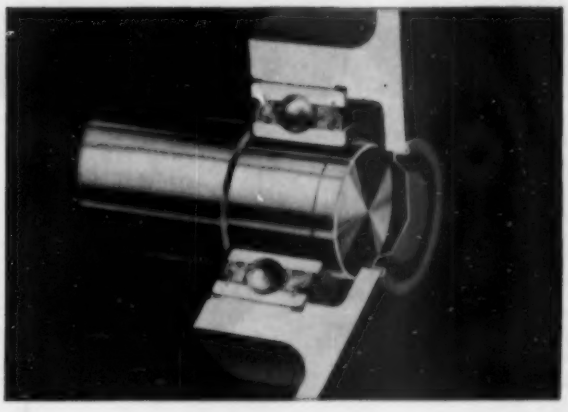
Get all the facts by calling your Westinghouse sales engineer . . .
The Man With The Facts!

J-21877

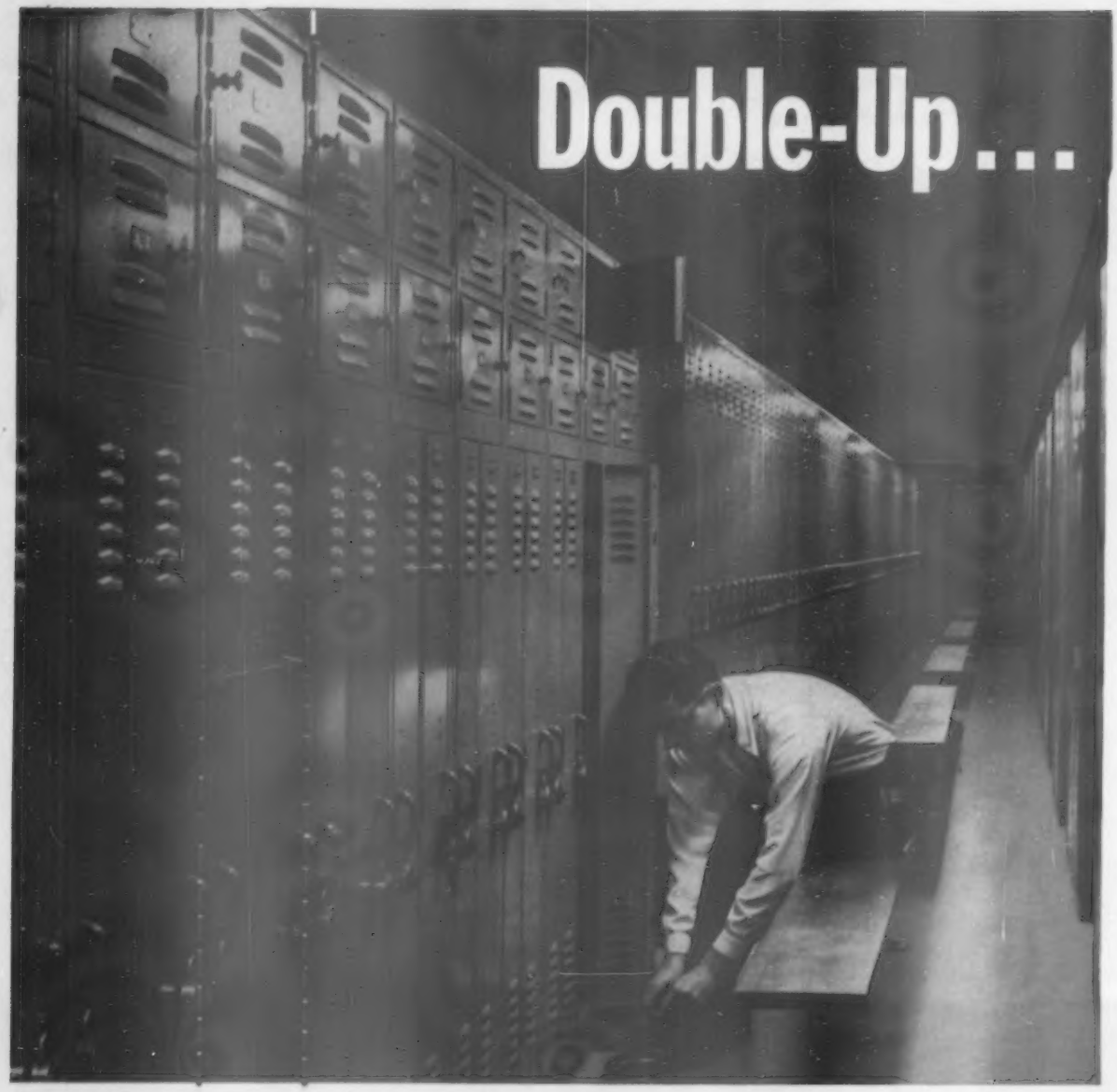
YOU CAN BE SURE...IF IT'S Westinghouse



Mechanical System Fact: New cast-iron housing on both drip-proof and totally-enclosed types. Ventilation openings only in end brackets make the motor drip-proof whether mounted on floor, ceiling or wall.



Lubrication System Fact: New "4-way sealed", pre-lubricated bearing eliminates completely the 3 main causes of bearing failure: 1) contamination, 2) over greasing, 3) wrong grease.



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Please send me complete literature on:

☐ Lockers ☐ Heat Exchanger Tubes
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ADDITIONAL SPACE-SAVING ECONOMY is provided by Republic's complete line of Materials Handling Equipment. It fits in with whatever type of system you use. Boxes, Skid and Pallets keep materials moving, stack readily, save floor space. Pallet Racks permit palletizing of bulky, odd-lot, fragile materials. You load or unload from either side without restacking. Wedge-Lock Steel Shelving supports tremendous loads with no sway, sag or buckling. Mail the coupon for further information.

in comfort with REPUBLIC'S "SPACESAVER" LOCKERS

It's the ideal locker where space must be conserved—or utilized to obtain the maximum number of locker accommodations.

A standard 15" in width, the Republic "Spacesaver" two-person locker, made by the Berger Division, provides separate compartments for two people in no more floor area than that required for one large individual single-tier locker. And yet the occupant has ample room to store his street wearing apparel and other personal effects.

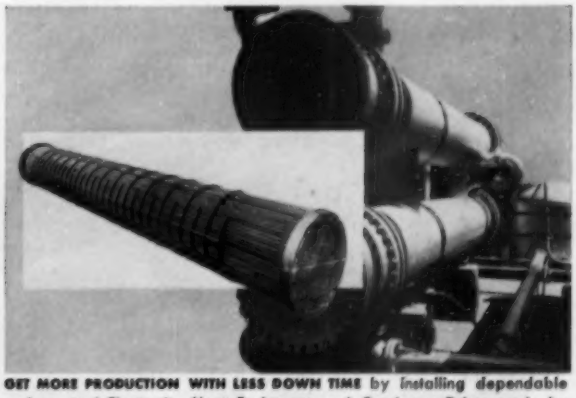
Each compact locker is equipped with Berger's unique pre-locking door. The door operates with either a built-in lock or a padlock. It is designed to provide locked security the instant it is closed. When a padlock is used, for example, simply relock it in the loop immediately after the door is opened. There's no need to rely on memory to safeguard belongings once the door is closed. There's no separate locking of the hat compartment to bother with, either. When closed, it locks simultaneously with the lower door by a foolproof innerlocking device.

Modern steel lockers that provide clean, safe storage for clothing and valuables can be a powerful aid to good employee relations. Investigate Berger's big line of quality lockers. Let Berger, the world's largest supplier of steel storage facilities, help you with your design, engineering or installation problems. Call your local Berger Sales Office. Or send coupon for descriptive literature.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

WHERE RUST RESISTANCE AND LONG LIFE ARE ESSENTIAL, like in these automotive drying ovens, use Republic Copper Steel sheets. These sheets are ductile, flat, easy to form and weld. Their uniformity, both structurally and chemically, assures freedom from expensive repairs or frequent replacements. Republic offers a full line of quality sheets for all types of fabrication —including galvanized, galvannealed, and stainless. Your nearby Republic distributor has them. Send coupon for more facts.



GET MORE PRODUCTION WITH LESS DOWN TIME by installing dependable carbon steel Electrunite Heat Exchanger and Condenser Tubes made by Republic's Steel and Tubes Division. For more than 25 years, process industries have found it pays to rely on Republic's high standards of quality control — from ore to finished product. Every length of tubing is ductile and must pass rigid tests for uniformity. Made to A.S.T.M. Specification A-214, applicable customer, or other heat exchanger specifications.

When you want the best in unit heating...

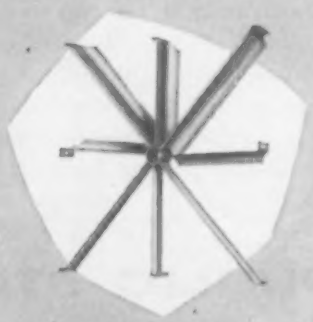
Look for the name MODINE

Like so many well-known, pioneer names . . . Frigidaire, Victrola, Kodak . . . "Modine" is commonly used as a descriptive word to identify all makes of steam and hot water unit heaters. But — if it doesn't carry the MODINE nameplate, *it is not a Modine Unit Heater.*

Only unit heaters designed and built by Modine give you all the performance and operating advantages which have made Modine the first name in unit heating for over a quarter century. And continuing research and development are your assurance that Modines will always be your best buy for heating comfort and economy.

More comfort per fuel dollar

Discharge air temperatures of 110° to 120°F are correctly related to air velocities, assuring perfect heating comfort plus lower fuel costs.



Greater heat throw

No one but Modine provides a built-in velocity generator that effectively steps up heat throw . . . assures positive heat penetration of cold air strata near floor.

A model for every need

Modine horizontal delivery models for steam and hot water are built in two distinct types (blow-through and draw-through) and 36 different capacities. A unit for every application.

Sturdy built-in fan guard

Safety fan guard of steel rod stock offers constant protection. Also serves as resilient motor mount, absorbing and dissipating fan vibration.

Modine Vertical Unit Heaters are offered in 26 different models, each with choice of 4 types of air deflectors. New light weight cuts installation costs.

8U-1286

Want the complete story?

For details on why Modine offers you the best in unit heating . . . more value, less trouble — contact the representative listed in your classified phone book. Or, ask for Catalog 155. Write to Modine Mfg. Co., 1505 De-Koven Ave., Racine, Wisconsin.

Modine

UNIT HEATERS

Between motors and machines...

V-Belt Drives Run Your Plant

Texrope drive transmits power from Allis-Chalmers 300-hp motor to crusher used in copper ore processing.

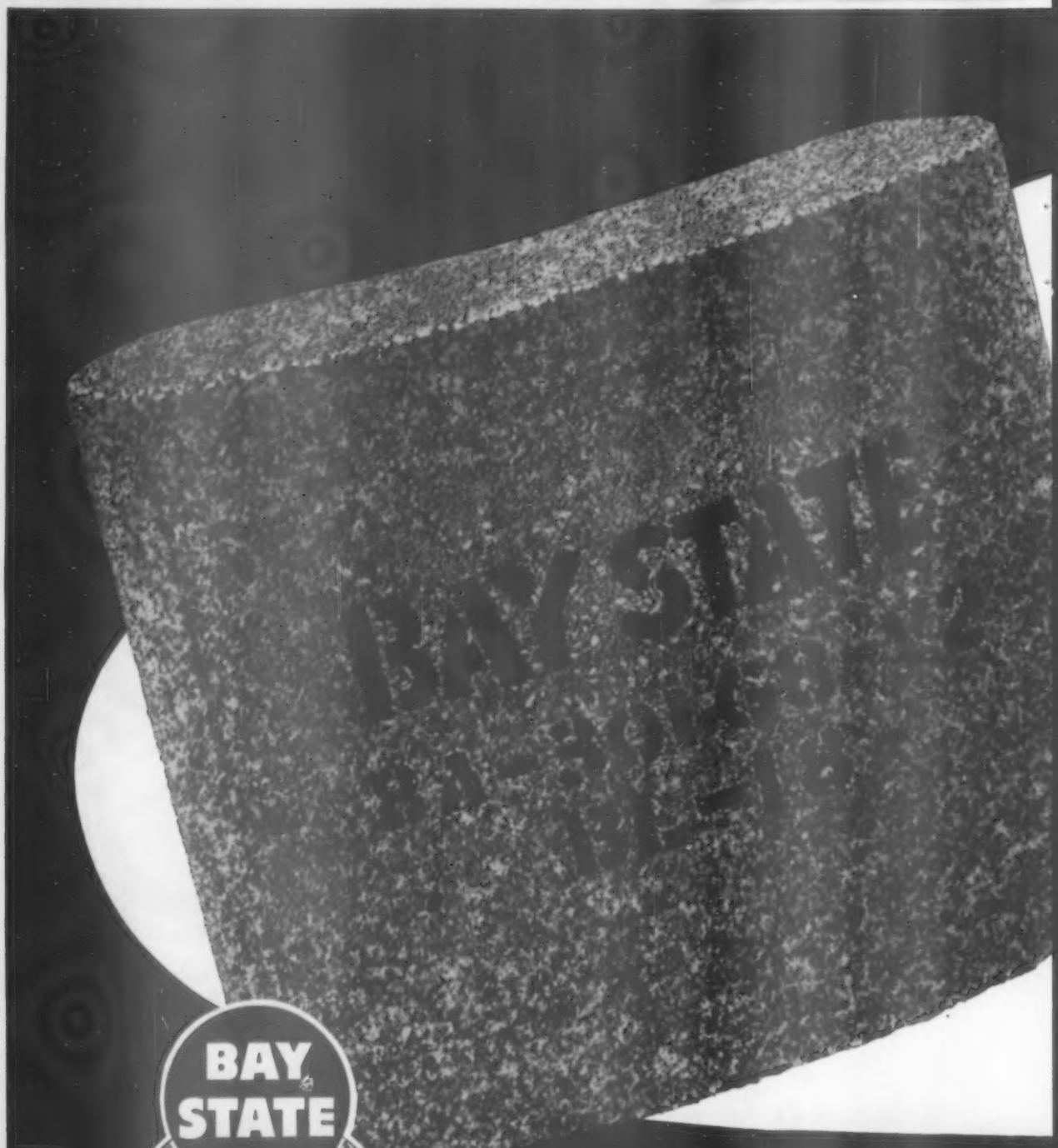
V-BELT drives are the vital link connecting power and production line. As such, they must install easily, combine high efficiency with dependability, and require minimum maintenance.

All these "vital link" characteristics are designed into *Texrope* V-belt drives by Allis-Chalmers, originator of multiple V-belt drives. *Texrope* drives feature specific advantages such as: *Magic-Grip* sheaves with "easy-on, easy-off" construction; the grommet belt which lasts 40% longer and costs no more than ordinary belts; and the *Vari-Pitch* sheave — the low-cost way to obtain variable speeds.

Whatever the application, there's one best *Texrope* drive to do the job most efficiently and economically. To find out more, contact your nearest Allis-Chalmers distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. A-4696

Texrope, Magic-Grip and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS



BAY STATE ®

WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.

Branch Offices and Warehouses — Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.

Distributors — All principal cities

In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

WITH 1 "SPEC"... 3 METALS!

It took BAY STATE segments *and* engineering to lick this problem for a New England manufacturer! Distributor abrasive engineer Jack Somers did it, and gave the customer *extra* values too.

Here's how this problem was solved

Gear blanks, timing gear cases, transmission housings and other products . . . some of steel (both hardened and soft), some of aluminum, and others of cast iron ...all had to be faced on rotating-table surface grinders. Obviously, savings could be made *if* the same set of segments could satisfactorily grind and finish all three metals.

Mr. Somers, using his specialized technical knowledge, proved it *could* be done . . . with the BAY STATE 8A-301G8-V2 specification.

Results: Cutting Action: EXCELLENT, on all three metals.

Segment Life: MORE THAN DOUBLE that of competitive specifications.

An *extra* value was the low cost of the "8A" abrasive, BAY STATE'S economy abrasive mixture which gives premium cutting characteristics at non-premium price.

Bay State can solve your grinding problems

Grinding gear case. Note how strobo-flash photo stops motion of coolant

Request BAY STATE'S free, "On-The-Job" engineering service (see coupon below), available through your local distributor, our district offices, or from Westboro.

This top-flight engineering service plus all the BAY STATE product superiorities, such as Fractional Grades (3 degrees of hardness within a single normal grade), Controlled Porosity, and the economy abrasive "8A" can bring about the solution to your grinding problems.

BAY STATE
WHEELS of PROGRESS

MAIL COUPON TODAY

Please send us Surface Grinding literature. ☐

We have a grinding problem. Please have a representative call. ☐

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AIM to save packaging

Bundling cans with Acme Steel Strapping assures 50% faster assembly, better securement, safer shipments. Idea No. S2-4

The F-1 Strapping machine automatically tensions, cuts and welds Steelstrap for faster production line packaging. Idea No. S4-1.

Better securement with steel strapping permits safe, more economical shipment of water heaters. Idea No. U1-1.

To realize more floor storage space, containers are assembled, and wire stitched as needed. Idea No. W1-6.

Fastening motors to wood bases with steel strapping resulted in a 10% saving in time and labor. Idea No. S7-6.

and shipping costs with these

Acme Steel ideas

Skids of paper are protectively wrapped and securely banded with steel strapping for shipment. Idea No. S3-12.

The Acme Steel Silverstitcher speeds carton assembly, gives in-transit protection of tacks and nails. Idea No. W1-2.

Acme Steel Strapping and Stitching ideas like these are but a few of hundreds that could conceivably work profits for you. They assure faster handling, less material expense, better use of warehouse space, better product protection and safe delivery.

Today, perhaps now, an Acme Idea Man is analyzing the packaging, handling and shipping methods of a company somewhere near you. His training, experience and ability to adapt wire stitching and steel strapping methods to your packaging operation are available to you without obligation. Why don't you get a free analysis now. Your Acme Idea Man will observe present methods, demonstrate Acme Steel equipment and recommend the best systems for you. Call him at your nearest Acme Steel office listed in the classified directory. Or send the coupon below for further information.

ask your *Acme Idea Man to help solve your problems

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ACME STEEL

These valuable Wire Stitching, Steel Strapping and Unitizing Books are yours free. Each describes scores of profitable cost cutting, time saving ideas made possible through the use of Acme Steel tools, materials and the ingenuity of an Acme Idea Man. Send today!

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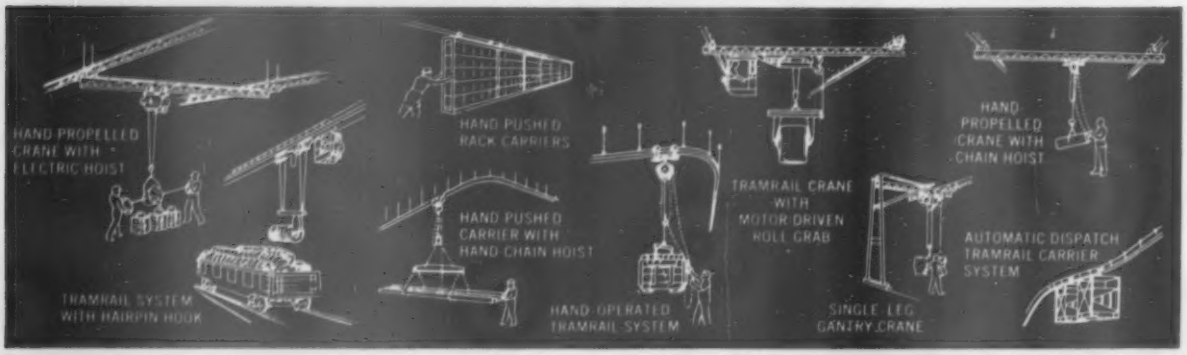
CLEVELAND TRAMRAIL SERVES EVERY INDUSTRY


HAND PROPELLED CRANE WITH ELECTRIC HOIST
HAND PUSHED RACK CARRIERS
HAND PROPELLED CRANE WITH CHAIN HOIST
HAND PUSHED CARRIER WITH HAND CHAIN HOIST
TRAMRAIL CRANE WITH MOTOR-DRIVEN ROLL GRAB
AUTOMATIC DISPATCH TRAMRAIL CARRIER SYSTEM
TRAMRAIL SYSTEM WITH HAIRPIN HOOK
HAND-OPERATED TRAMRAIL SYSTEM
SINGLE LEG GANTRY CRANE

Simple hand-pushed cranes with electric hoists handle heavy loads quickly and easily.

5 tons (4545 kg.) steel sheets easily handled by one man. Hoist and carrier travel motor-driven.

Over 1,000 foundries have Cleveland Tramrail and are making big savings.

TRIED AND PROVEN COST-CUTTING EQUIPMENT

The variety of ways in which Cleveland Tramrail is serving industry is amazing. It delivers materials from storage or car or truck, directly to point of work without rehandling—transports delicate, fragile wares without damage—moves hot molten metals safely—carries materials between distant points on the same or different floors or buildings. It speeds production, improves plant efficiency and cuts costs. Regardless of size or type, most installations pay for themselves in one year and keep on paying goodly dividends year after year thereafter.

STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

Cleveland Tramrail consists of track, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousand-fold ways to serve nearly every need. Equipment can be made in all variations from simple hand or electric floor-operated, to cab controlled and automatic plant-wide systems.

40,000 INSTALLATIONS

Over 9,000 customers have purchased 40,000 installations of Cleveland Tramrail and many of these are still in continuous operation after 25 or more years of service.

10-ton (9090 kg.) transfer bridge system handles giant airplanes. Cleveland Tramrail serves many large aircraft plants.

Heavy rolls of paper up to 6,000 pounds (2727 kg.) are handled with this motorized grab and crane.

Heavy beams are easily conveyed overhead in textile weave rooms with simple inexpensive Tramrail cranes.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
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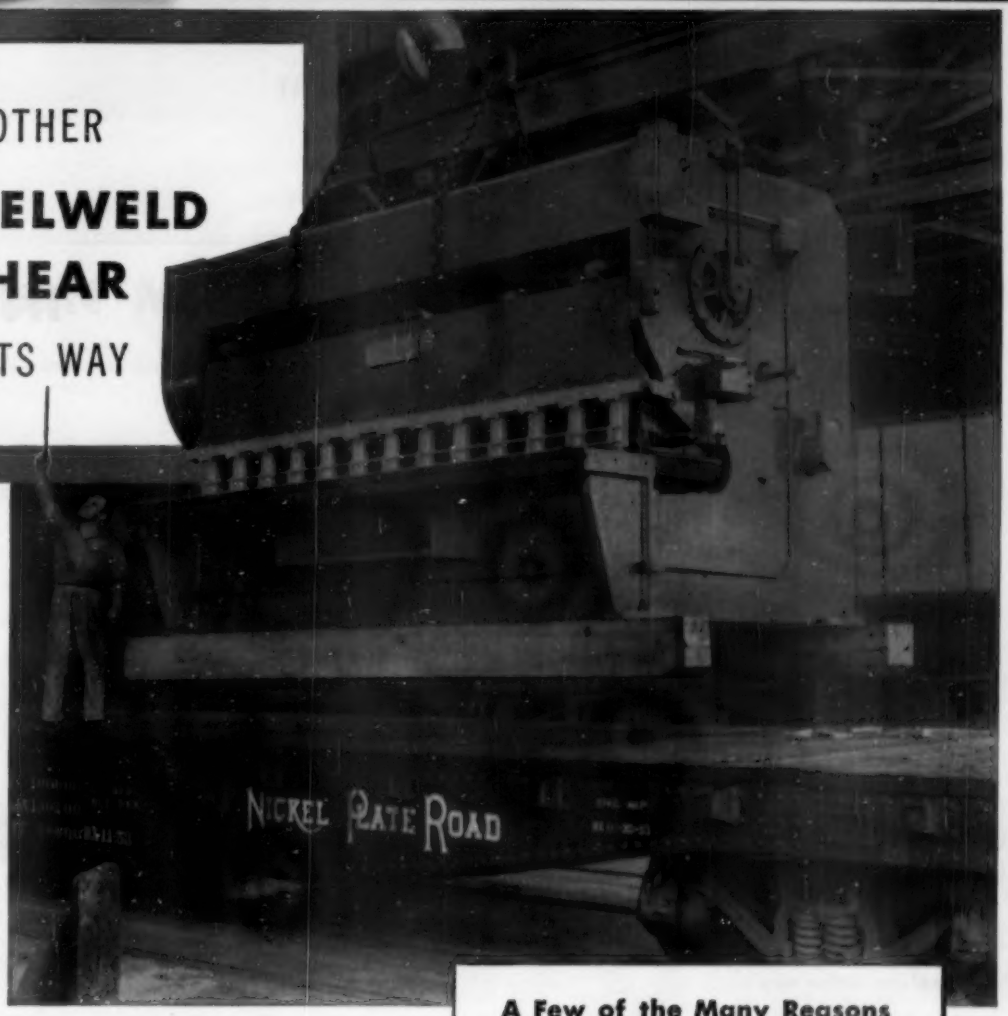
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

ANOTHER

STEELWELD SHEAR

ON ITS WAY



From every angle a Steelweld shear looks good — and is good. This machine is rated for 12'-0"x1½" steel

SHIPMENTS are being made at a rapid rate to all parts of the country because more and more users are learning of the many merits of Steelweld Shears and are talking about them. As the words of experience spread about and comparisons are made, more and more people come to realize that Steelweld Shears are really outstanding.

For smooth, accurate burr-free cutting, Steelwelds can't be beat. For ease of operation they have no peer. Their heavy construction and means for simple, easy maintenance assure long trouble-free life.

For the finest in shearing, you can't make a better selection than Steelweld. Say the word and we'll have one of these wonderful machines on the way to you.

A Few of the Many Reasons For STEELWELD'S DEMAND

1. Pivoted-blade operation. Entirely different from every other shear. No slides or guides to wear and cause inaccuracies.
2. Micro-set knife adjustment. Quick easy knife-clearance adjustment for every plate thickness. Something not matched elsewhere. Be sure to get the complete story on this.
3. Mechanical hold-downs. Tight gripping, non-leaking, quiet operating.
4. Accurate easy operating back gauge rides on ball bearings.
5. Cool-operating, long-life, low-inertia clutch and brake.
6. Heavy all-welded rigid one-piece steel frame.

AVAILABLE FOR PLATE LENGTHS TO 24 FEET AND THICKNESSES TO 1½ INCH

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CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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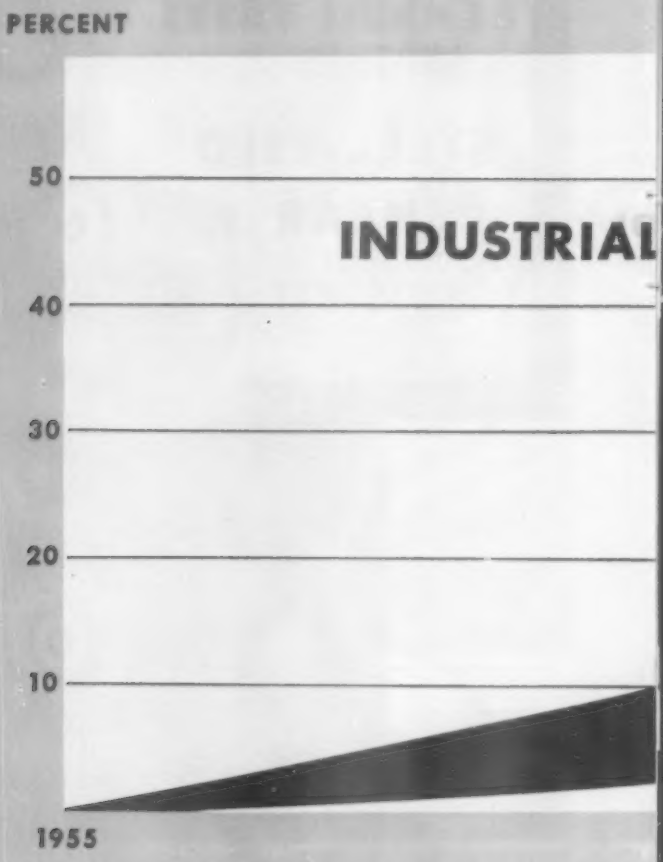
STEELWELD PIVOTED BLADE SHEARS

By 1965...

H. F. McCULLOUGH, general manager, Service Shops Department, General Electric Co. explains below why . . .



WITH INCREASED EMPHASIS ON AUTOMATION . . .

"Accent on maintenance" becomes industry's

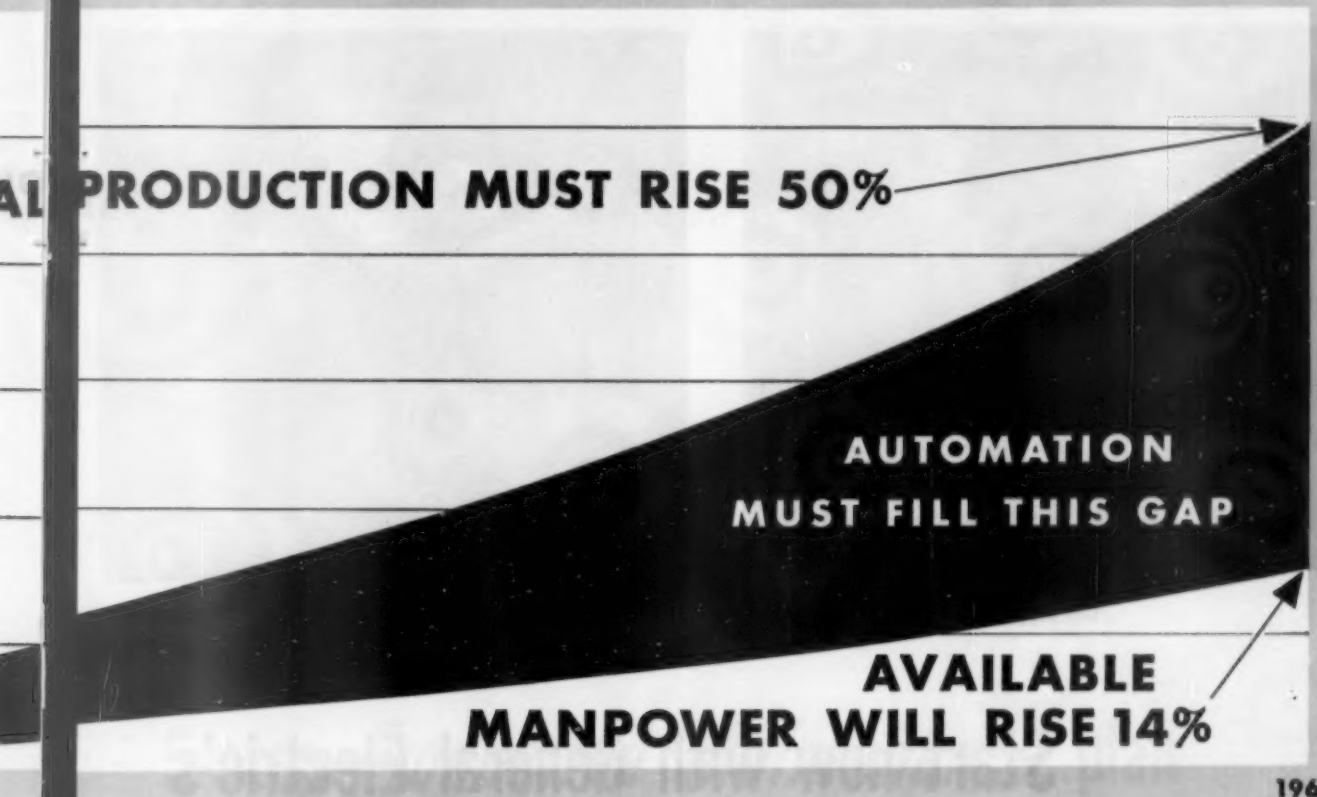
It's no secret that American industry today is making giant strides into a new era—marked by the increased use of automatic machines, more continuous process methods, and a greater application of electric power per manhour. This era of automation is a result of the sharpening of competition, requiring more production from existing equipment, better methods for making better products, and better machines to do more work at less cost.

• **Taken for granted**—But all this is focussing new attention on a production factor hitherto taken for granted—maintenance. For as more automatic machines are introduced to quicken the production tempo, and to make up for limited available manpower and to reduce product cost, the maintenance function assumes a far greater importance. As one indication of this, the cost of all industrial maintenance in 1952 was over $11 billion, while by 1965 it is estimated to reach $22 billion annually.

• **Production demands**—Present and future production demands require the training of highly skilled and well planned maintenance to prevent idle machinery and profit-eating downtime costs. The ultimate aim of any maintenance program is to reduce unit cost of goods sold; therefore, planned maintenance helps the manufacturer do this by getting the maximum use from his equipment and reminding him to make modifications or renewals on a planned rather than a hit-or-miss basis. With this trend towards automation, today's stepped-up production combined with increased labor, materials and equipment costs dictates a scheduled maintenance program.

• **Maintenance not ready**—On its present scale, maintenance cannot successfully cope with the staggering job ahead. To back up the abilities of maintenance men and their effective use of tools and materials, management too must apply to maintenance the same skill, brains and capital investment that have so strikingly improved production planning and techniques. In fact, with automation, production itself depends largely on the proper planning and execution of equipment maintenance.

• **Involuntary shutdown**—It must be remembered that an emergency downtime during production not only results in



key to all future production planning

lost production and profits, but also forces upon labor an involuntary layoff; therefore, machinery equipment failure is as disastrous for all when it occurs on a production line geared for high production with a large degree of automation. Again it comes down to the question of maintenance. Does management wait for a failure then apply maintenance on a put-out-the-fire basis or does management put into effect good maintenance practices, scheduling maintenance at times most convenient to the production line. Scheduled maintenance minimizes the "dollar" loss. Naturally all emergency shutdowns cannot be eliminated, but Productive Maintenance can and is reducing such situations.

• **Management and maintenance**—One fact that emerges is that management and maintenance must join forces in a carefully thought-out program to meet the challenge of automation. Both are part of the company team, interested in bringing the many benefits of planned equipment maintenance to the over-all job of delivering goods to customers on time, using manpower most efficiently, and keeping product cost low.

FOR AN EFFECTIVE APPROACH TO THIS IMPORTANT PROBLEM

GENERAL ELECTRIC

When management teams up with maintenance, the result is

YOUR G-E MAINTENANCE SPECIALIST will supply complete parts data . . .

. . . guide you in planning routine inspection, routine maintenance and parts inventories . . .

Start now with General Electric's

HERE'S THE 5-STEP PLAN IN BRIEF: (and General Electric can help you with every step)	**1** Gather complete equipment data from your machines and motors	**2** Evaluate routine maintenance to determine how much care is warranted
3 Establish a routine operating control system	**4** Evaluate the critical maintenance that is needed	**5** Establish a critical maintenance program

more effective maintenance that actually adds production capacity

. . . help you determine condition of all critical equipment and help schedule planned overhaul . . .

. . . help analyze critical equipment for best protection of each machine.

5-step *Productive Maintenance* plan

It organizes the application of men, tools and materials to help protect capital investment, increase productivity, reduce product cost

A practical, realistic approach to the growing importance of maintenance in the automation era is General Electric's Productive Maintenance plan. In a simple 5-step sequence, it organizes the elements involved in controlling equipment downtime to improve maintenance of electrical systems. Because it is applicable to any type of industrial operation, it is becoming widely accepted throughout industry by management and maintenance men alike. Learn more about how this plan can help you obtain more output from existing facilities. Use the coupon to have a G-E Maintenance Specialist call and supply you with complete information. General Electric Co., Schenectady 5, N. Y.

General Electric Company
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- ☐ Please send me the detailed manual (GEA-6087) on setting up a Productive Maintenance Program in my plant.
- ☐ Please have a Maintenance Specialist from my nearest G-E Service Shop call on me.
- ☐ I would like to schedule a showing of the film "Productive Maintenance."

NAME.....

POSITION.....

COMPANY.....

CITY..... STATE.....

***Productive Maintenance*—as vital as production itself!**

GENERAL ELECTRIC

John O. Gantner, Jr., President of Gantner of California, reveals why

"She always has the last word!"

"They say a woman will always have the last word. It's certainly true when she shops for a swimming suit!

"She waits till the last possible minute, and insists she get the 'last word' in style. Pressure on stores is terrific. If 'hot' styles run out of stock, those sales are gone forever.

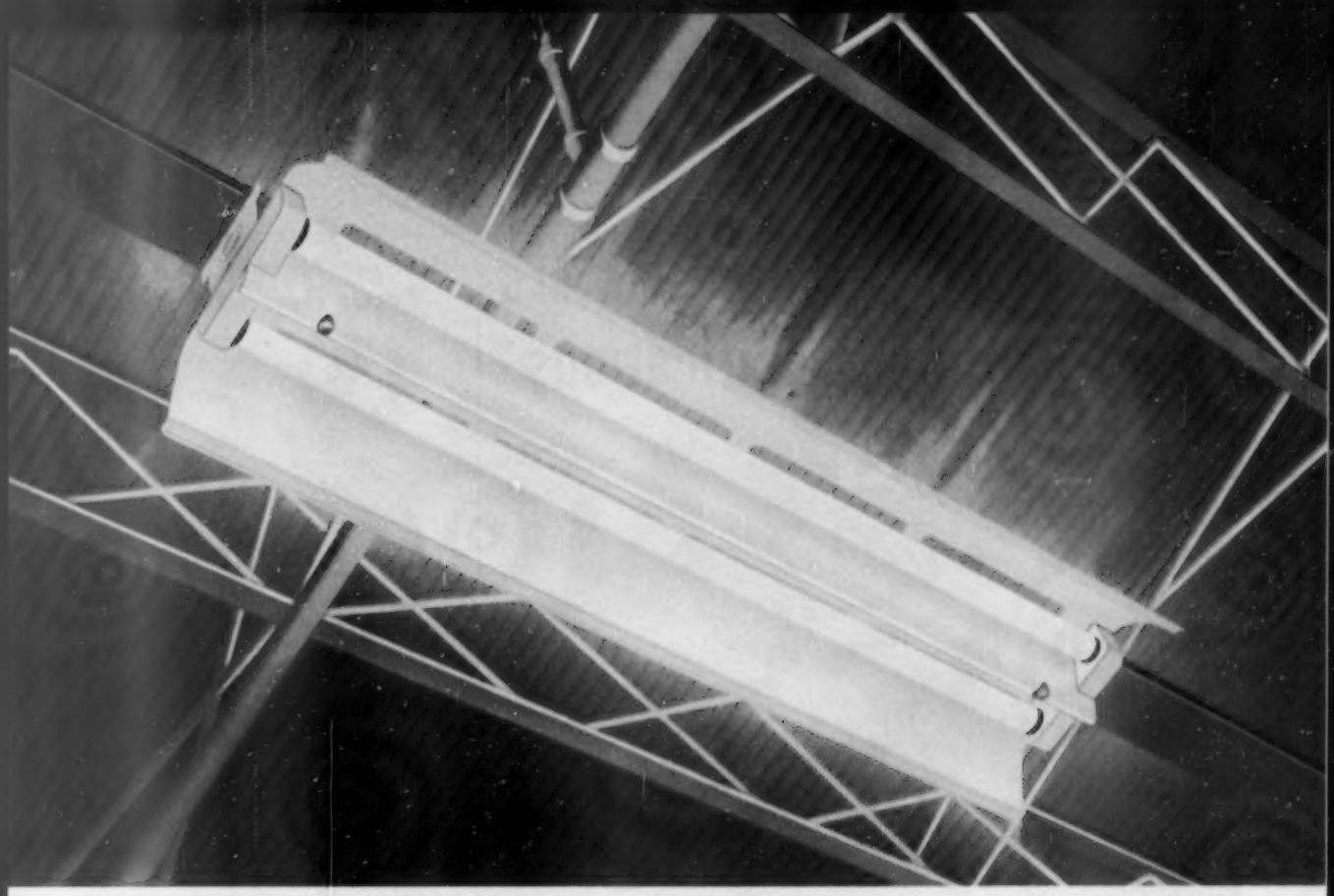
"But our retail accounts know they can depend on Gantner. Gantner styles can be restocked to any store in the country in a few hours, *while the ads are running*. Not a moment is lost — not a sale is lost — thanks to Air Express!

"And one last word — about costs. Specifying Air Express can save you money, too. 15 lbs. from San Francisco to Chicago, for example, costs $10.91. That's $1.09 less than any other complete air service!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* **RAILWAY EXPRESS AGENCY**



Sylvania Diamond-I Line. Like a polished gem with many facets, this new semi-direct fixture transmits *more* light—delivers a full 25% upward component, and an extremely high illumination efficiency of 89%.

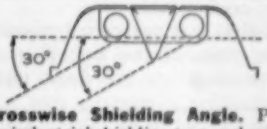
THE NEW SYLVANIA Diamond-I LINE
—*Untraps all usable light*

Introducing the pace-setter of an entirely new trend in plant illumination—the Sylvania *Diamond-I*. This semi-direct fixture releases light and heat that would normally be trapped between the reflector and the tops of the fluorescent lamps in other fixture types. It puts more light to work for you—gives you an extremely high illumination efficiency of 89%!

In meeting or exceeding all the new RLM improved requirements for lighting, the *Diamond-I* directs a full 25% of its light upward through reflector slotting. This illuminates ceiling areas above fixtures, eliminates sharp contrasts overhead, reduces harsh shadows and glares. Its porcelainized reflector-shield spreads a full, even illumination over working areas below.

Designed for one-man maintenance, the Sylvania *Diamond-I* Line is engineered to cut your costs to the bone. Each unit consists of only two major components—a complete channel assembly and an easily removed reflector-shield assembly. Whether an installation calls for 4- or 8-foot units, the reflector-shield is always a lightweight, easy-to-handle 4 feet long. Slots in shielding produce upward draft which carries away dust particles that would normally settle on lamps and reflectors.

The Sylvania *Diamond-I* Line is a real investment in better seeing and working conditions. Estimate the real returns to you—higher production rates, higher-quality output, improved morale, lower accident rate, and a longer-life fixture that requires a minimum of maintenance. Send the coupon for more detailed information.



30° Crosswise Shielding Angle. Provides superior industrial shielding to guard eyes from direct glare of lamps.

Ease of Maintenance
One-piece 4-foot reflector-shield—easy for one man to remove for cleaning. Multi-socket lampholders simplify lamp changes.

SYLVANIA®

...fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

Sylvania Electric Products Inc.
Dept. M1, 1740 Broadway, New York 19, N. Y.

☐ Please send me detailed information on the new Sylvania *Diamond-I* fixture.

☐ Have a Sylvania lighting specialist call on me.

Name_____ Title_____

Firm_____

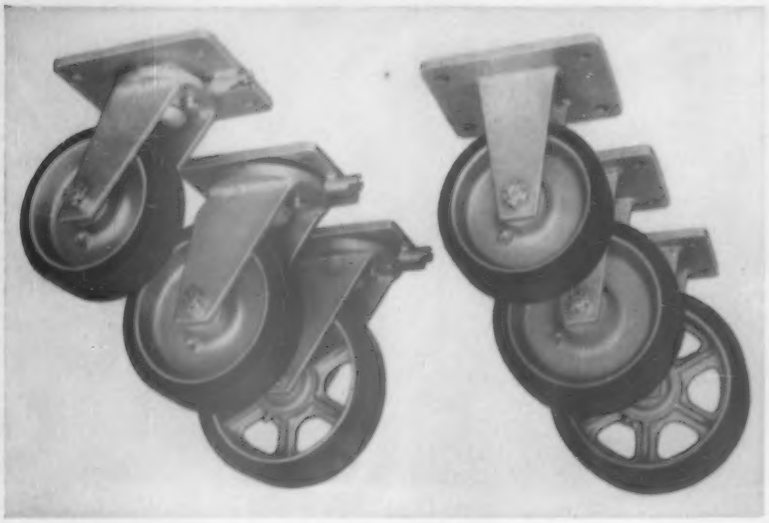
Address_____

City_____ Zone____ State_____

MATERIALS-HANDLING NEWS

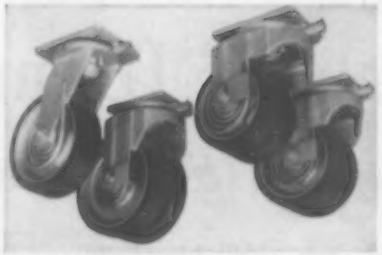
★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

New Bassick "MilSpec" Casters meet military specifications



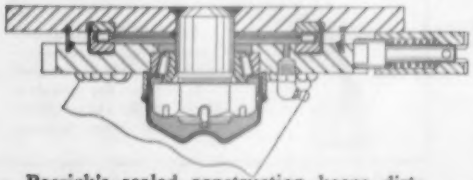
Bassick's new "MilSpec" line is specifically designed and engineered to meet the requirements of MIL-4749 and MIL-C-4750 for precision swivel and wheel bearings, sealed bearings, adjustable swivel bearings.

The new line includes 8, 10 and 12 in. heavy-duty, swivel and rigid casters for both inside and outside service on either hand- or power-pulled materials-handling equipment.

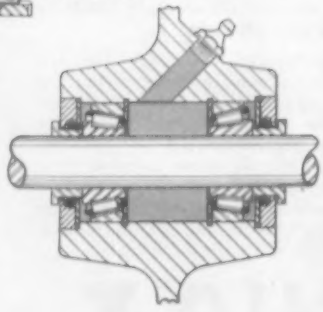


The swivel bearings are self-contained, precision units of the highest quality. Wheel bearings are the finest tapered type. Threaded king bolt and slotted nut construction make fine adjustment of swivel bearing possible.

"MilSpec" sealed swivel and wheel bearing assembly



Gray areas show lubrication reservoirs.



Bassick's sealed construction keeps dirt, water and foreign matter out of both wheel (right) and swivel bearing (above) assemblies of "MilSpec" casters. Protective lubricant stays in to prolong life and insure easy action. Alemite pressure-type grease fittings permit flushing and re-greasing with standard grease guns.

MilSpec "Floating-Hub" Caster gives safe ride

Important in the new "MilSpec" line is Bassick's famous "Floating-Hub" caster.

Smothers shocks

It combines the shock absorption of "Floating-Hub's" sprung-wheel construction with the precision quality of "MilSpec" casters. MilSpec "Floating-Hubs" give any load a safe ride — should be first choice in handling any equipment subject to damage in moving.

Tops on rough terrain

They're also better suited for higher speeds and rougher terrains than ordinary casters. And with adjustable precision sealed bearings, MilSpec "Floating-Hubs" will stay on the job long after lesser casters call it quits.

Write for information

Write to Bassick for printed data on the new "MilSpec" casters. Remember — an original investment in quality casters pays off in added years of trouble-free, money-saving performance. Specify Bassick casters and you'll be sure you have the best.

There is an authorized distributor of Bassick casters conveniently located to give you service. He's always a good source of information about new product developments.

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

Bassick
A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS...MAKING CASTERS DO MORE

Write for a copy of the
OTTAWA 60 BLUE SHEET
This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.
ADDRESS DEPT. F-72

OTTAWA 60 is a *new* die steel, an A-L "original," developed primarily to deep draw and form stainless steel. As intended, it performs without galling or pickup and shows exceptional wear resistance in that service. We have plenty of case histories to show you in proof.

But *wherever* you use Ottawa 60 draw dies—not just on stainless steel—this high-carbon, high-vanadium alloy comes through for you. Illustrated above are the first and second draws on transformer housings, produced from .037" gauge SAE 1010 strip. The company formerly used dies made of 5% chrome air-hardening die steel—and later a more highly alloyed material—without ever getting more than about 2000 pieces before the dies began to show gall marks and pickup, and parts were rejected due to scoring, breakage and oversize. *Dies made from Ottawa 60 forgings cured that! Results after 25,000 pieces showed no pickup and no wear on punch or die.*

● You can solve many a problem and save real money with Ottawa 60 draw dies! Write for information or call in our Field Service Staff to help you get started. ***Allegheny Ludlum Steel Corporation, Oliver Bulding, Pittsburgh 22, Pa.***

For complete **MODERN** Tooling, call

Allegheny Ludlum

WOD 5463

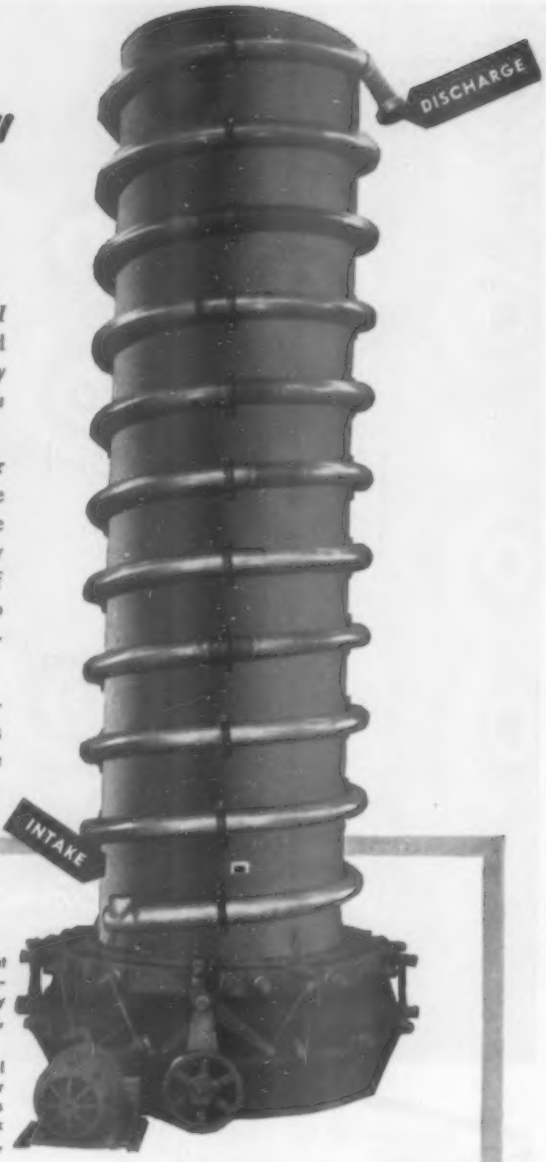
AL® FINE TOOL STEELS SINCE 1854

GOT AN "IMPOSSIBLE" CONVEYING JOB?

CARRIER Natural-Frequency Conveyors *(BOTH horizontal and vertical)* have all but revolutionized an important branch of the conveyor industry, *and they have done it by accomplishing "impossible" results on toughest products and processes.*

Natural-Frequency Conveyors differ from *all* other vibrating conveyors. Carrier Conveyors utilize the scientific laws of Natural Frequency, substituting the natural resonant action of springs for brute force. By *using* this harmonic Natural Frequency instead of "fighting it", Carrier Conveyors offer advantages so amazing as to seem impossible until you have experienced them.

Carrier Natural-Frequency Conveyors are now delivering spectacular performances for scores of America's biggest, most successful industrials. *Mail the coupon today for all the facts!*



For Instance—Rocket Fuel Conveyed Safely By Unique Carrier Spiral!

Rocket fuel powder is as temperamental and dangerous as a land mine. It's hydroscopic, quickly builds up heavy static electricity. Even the slightest contact with oil or grease will create a hazard. It is obviously a conveying nightmare for the manufacturer.

Handling (and elevating) rocket fuel is a cinch for the Carrier Spiral Vibrating Conveyor shown above. The powder is elevated through that totally-enclosed, spiralling, stainless-steel tube—elevated quickly, gently and safely, in a grounded, air-tight, self-cleaning conveyor.

This is just one of many unusual problems solved by a Carrier Natural-Frequency Conveyor. Tell us yours and see what we can work out for you. There's no obligation, of course!

CARRIER ~~NATURAL-FREQUENCY~~ CONVEYORS

Carrier Conveyor Corporation
265 N. Jackson St., Louisville 6, Kentucky

Gentlemen:

Without obligation, please send me Carrier Natural-Frequency Conveyor Bulletin No. 111.

Firm_____

Street_____

City_____ State_____

Att. Mr._____ Dept._____

CARRIER ADVANTAGES

HIGH CONVEYING SPEED
(Up to 100 feet per minute)

GREATER CAPACITY
(Up to 200 tons per hour)

LESS POWER REQUIRED
(About one-third as much as "competitive" equipment)

LESS MAINTENANCE & DOWN-TIME
(Less power + good design = trouble-free performance)

NO DAMPENING UNDER LOAD
(Designed with extra power for specified load, with positive stroke)

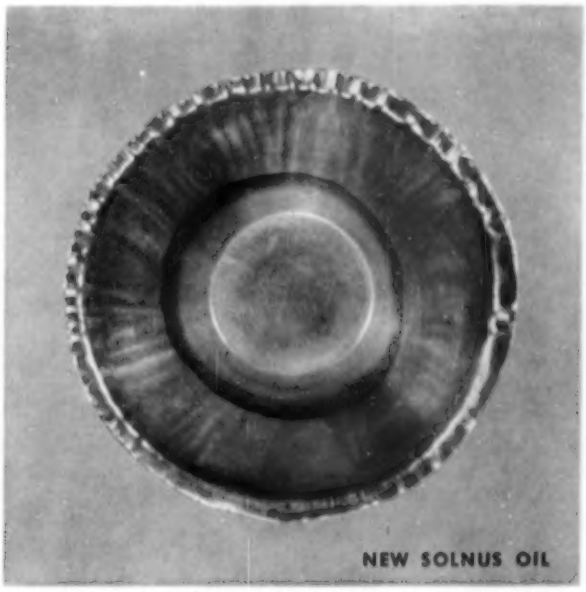
SELF-CLEANING
(Continuous, smooth trough — no pockets)

COMBINES PROCESSING WITH CONVEYING
(Can screen, dry, cool, dewater, blend, etc.)

WIDTHS FROM 6" TO 48"—LENGTHS FROM 5' TO 250'
(With pans 16 ga to ½" plate, of any metal, open or enclosed)

BALANCED, VIBRATION-FREE UNITS AVAILABLE
(For use on ceilings or light floor construction)

To demonstrate the comparative deposit-forming tendencies of compressor oils, two drops of a typical compressor oil were heated until evaporated. Notice the large deposit, *most of which is carbon*, left by the typical compressor oil. A new Solnus oil, after the same evaporation test, leaves a much smaller deposit.



NEW SOLNUS OILS HELP KEEP COMPRESSORS CARBON-FREE

THREE MINUTE TEST right at your desk shows why Solnus oils are the best for your compressors.

The chief enemy of air compressors is carbon build-up. The best way to avoid this hazard is to use the compressor oil that has the lowest carbon-forming tendency.

Sun's new Solnus oils have been proved to be ideal compressor lubricants. The minute amounts of carbon that form are fluffy and blow away easily . . . assurance against dangerous build-up of carbon on valves and exhaust ports. Tear-downs for cleaning are kept to a minimum.

We'd like to show you, right on your desk top, the dramatic test pictured above. Ask your Sun representative about it the next time he calls or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. SI.

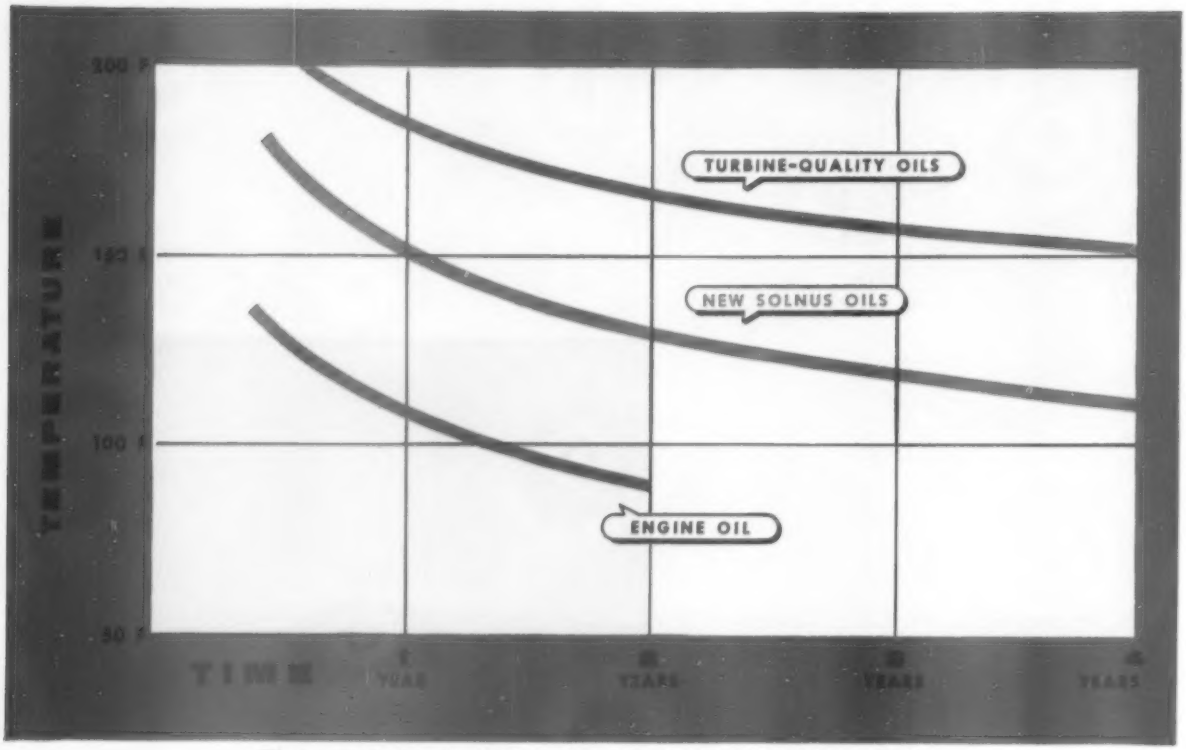
Please turn to the next page

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL



This graph is based on 10% make-up per year and a 40-hour week.
The yellow area represents approximately 80% of all applications.

NEW SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

High grade lubricants for squirt-can prices . . . New Solnus oils give more lubrication per dollar

The lubricated parts of most machines—our estimate is 80%—operate at temperatures below 130 F and the time between oil changes is less than 2 years. New Solnus oils were specifically developed to meet these operating conditions at the lowest possible cost.

The above graph compares the service life of new Solnus oils with that of an expensive, turbine-quality oil, and an oil of the type old-timers call "engine oil". The service life of the turbine-quality oil is excellent and probably covers 99% of all applications . . . but for a premium price! The engine oil has a very limited life. It cannot be used safely, except for a very short time, at even moderately high operating temperatures, and it gives very little protection against rust and corrosion.

Now look at the service life of new Solnus oils. They easily meet the service requirements of at least 80% of all oil lubrication jobs and they sell for a squirt-can price! In addition, new Solnus oils are fortified to prevent both rust and oxidation . . . a feature usually found only in more expensive oils.

For the full story on new Solnus oils, see your Sun representative or write Sun Oil Company, Philadelphia 3, Pa., Dept. SI.

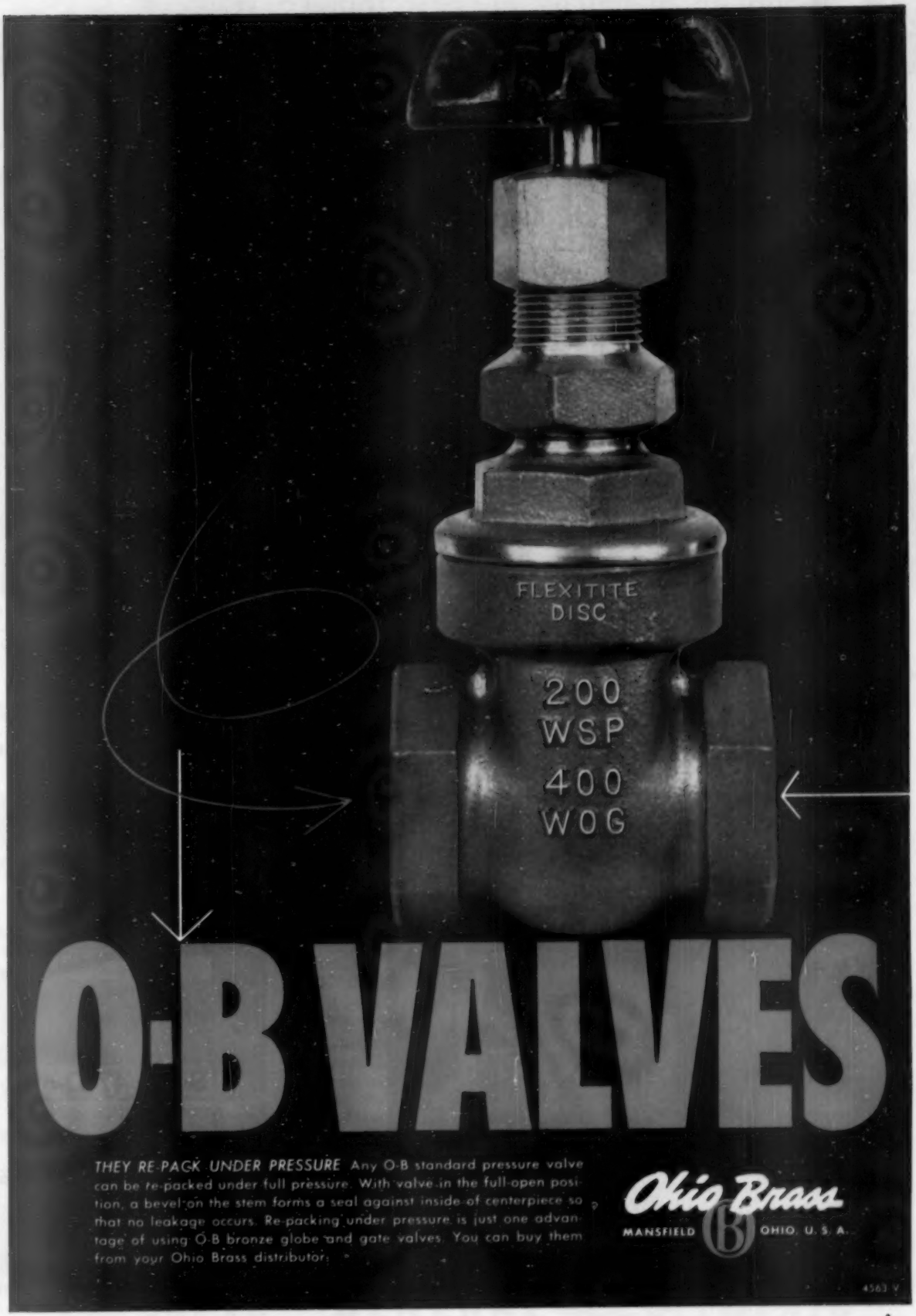
SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

In Canada: Sun Oil Company, Ltd., Toronto and Montreal



O-B VALVES

THEY RE-PACK UNDER PRESSURE Any O-B standard pressure valve can be re-packed under full pressure. With valve in the full-open position, a bevel on the stem forms a seal against inside of centerpiece so that no leakage occurs. Re-packing under pressure is just one advantage of using O-B bronze globe and gate valves. You can buy them from your Ohio Brass distributor.

Ohio Brass

MANSFIELD OHIO, U. S. A.

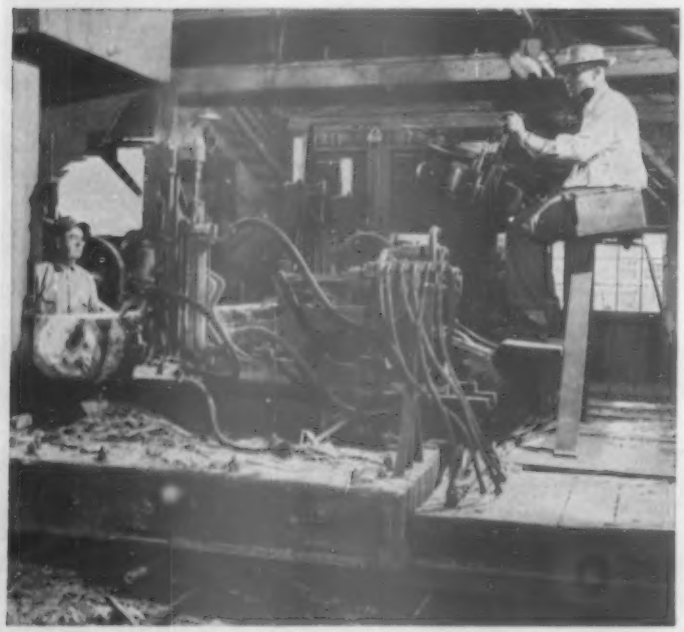
4563 V

PROGRESS IN DIRECT CURRENT DRIVES

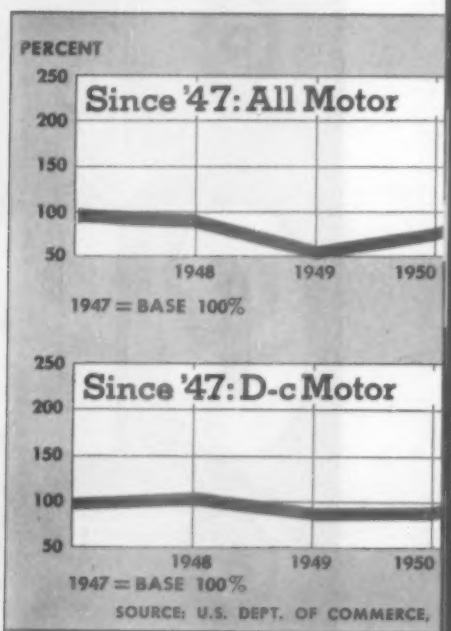
- Industry faces problem of increasing output without increasing costs.
- Automatic processing proves solution for many large and small plants.
- Statistics show growing demand for d-c motors as U.S. business swings to . . .

210,000 96-PAGE PAPERS AN HOUR is output of Philadelphia Evening and Sunday Bulletin presses driven by 86 40 hp G-E direct-current motors. Newspapers across

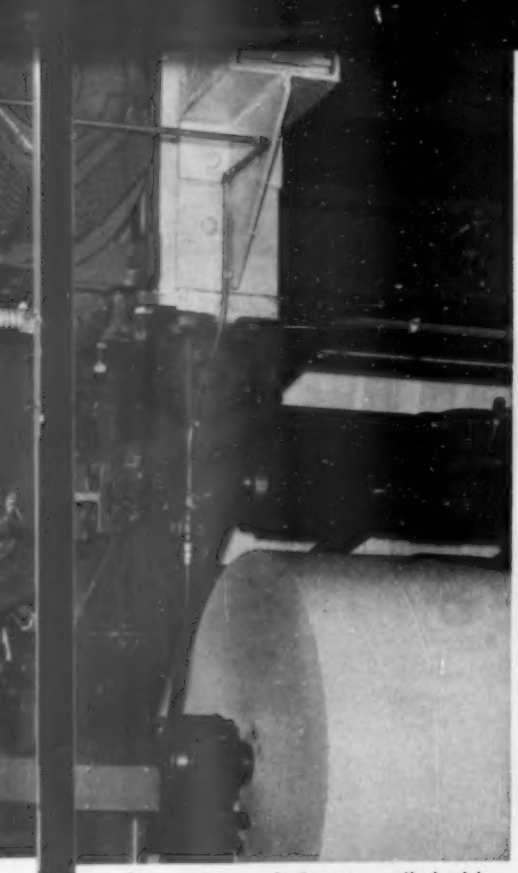
D-c Drives: The Key to High



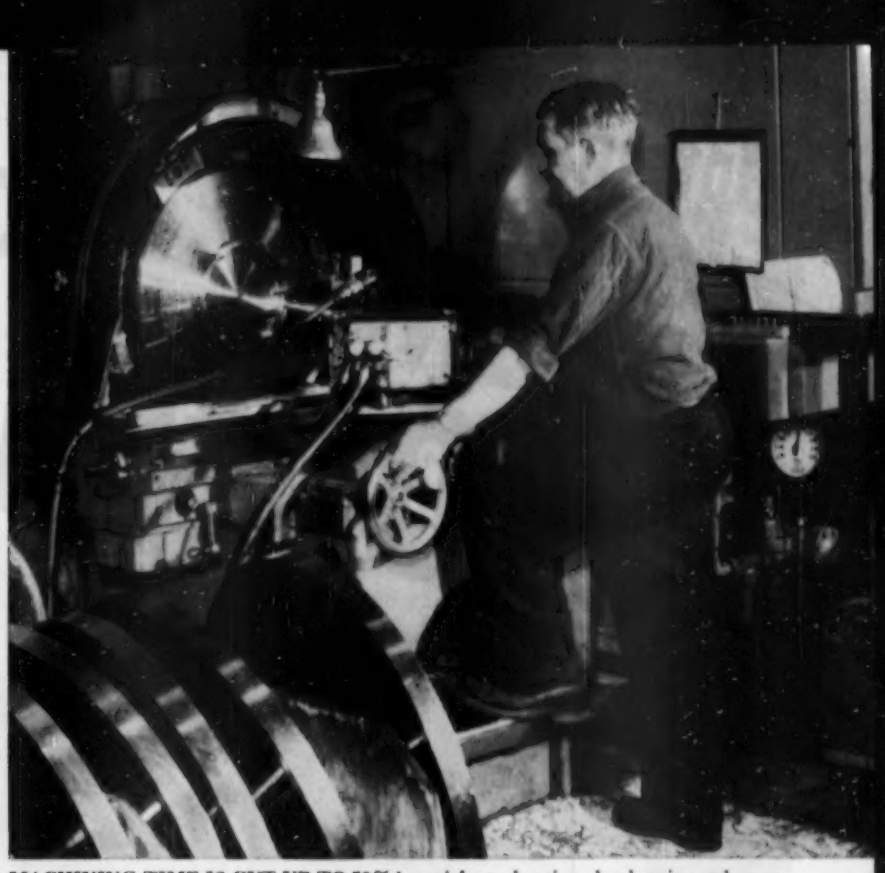
$20,000 A YEAR SAVINGS in steam costs is reported by Crossett Lumber Co., Crossett, Ark., after converting steam-driven log carriages to G-E direct-current drives. D-c motors maintain 220,000 board feet per day output.



DC MOTOR PURCHASES REACH NEW HIGH. During period which saw 20% rise in all motor sales, direct-current motor

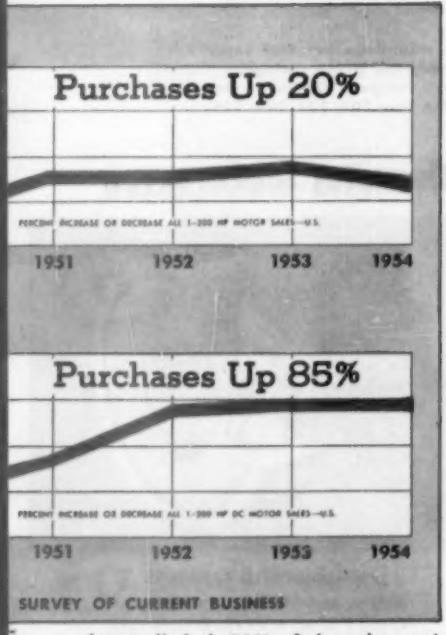


the country are swinging to versatile d-c drives for an almost infinite number of speed steps, smooth acceleration and deceleration of presses, and a drastic reduction in paper waste.



MACHINING TIME IS CUT UP TO 50% by quick acceleration, deceleration and reversals provided by packaged General Electric direct-current drives. Above, adjustable-speed d-c motors provide constant surface-cutting speed for lathe machining jet engine wheels at the Lycoming Division of Avco Manufacturing Company, Stratford, Conn.

Output, Low-cost Production



purchases climbed 85%. Industry's trend to automatic production has led to the increased demand for d-c drives and equipment.

Throughout the U.S., in factories large and small, direct-current motors are meeting the demands of accelerated, low-cost production.

• **Examples**—D-c driven newspaper presses roll out up to 210,000 96-page papers an hour. By converting steam driven log carriages to direct-current drives, one lumber mill reports savings of $20,000 a year in steam costs alone. D-c equipped machine tools have cut machining time up to 50%.

• **Industry-wide**—Steel, textiles, materials handling, mining and many other industries are making greater use of automatic techniques to boost production and lower manufacturing costs. This trend has led to an increased demand for direct-current motors (graphs left).

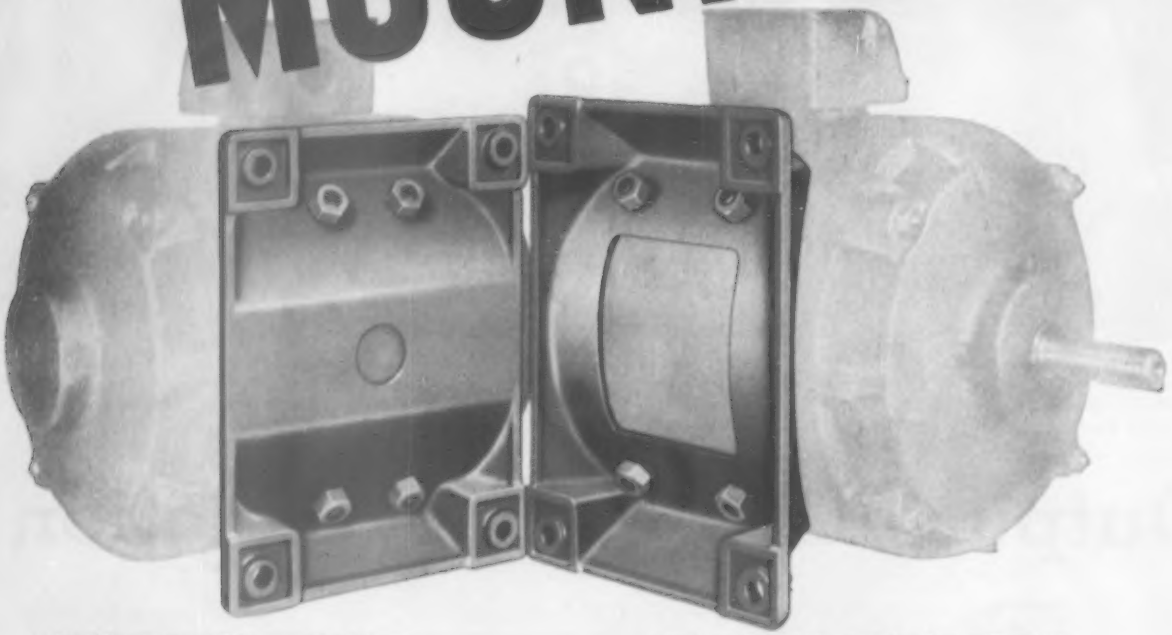
• **Reasons**—For top efficiency, automatic processing requires controlled high-speed action and drive flexibility. Both of these requirements are best supplied by d-c equipment. In addition, direct-current drives often increase versatility and output of a driven machine to such an extent that cost per unit of production is substantially reduced.

• **D-c power from a-c source**—A-c to d-c conversion equipment, such as G-E Speed Variators and motor-generator sets, enable industry to obtain d-c power simply and economically. Packaged conversion units may be placed next to driven machines or in other convenient load-center locations.

• **More information**—General Electric has specialists for every industrial field in convenient locations throughout the country. Engineers in 149 G-E Apparatus Sales Offices are ready to supply industry with complete information on how d-c drives can boost output and reduce manufacturing costs. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 818-2

GENERAL ELECTRIC

Optional FRAME MOUNTINGS A. O. Smith



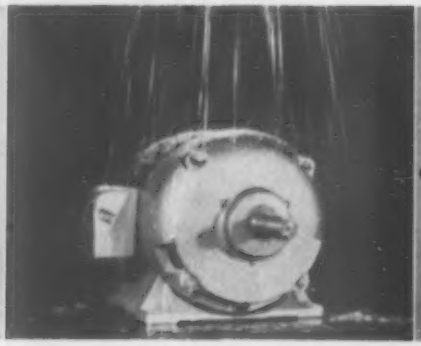
Want to use new NEMA mounting dimensions for integral horsepower motors? Do it with A. O. Smith Integrals! Optional frame mountings fit NEMA sizes 182, 184, 213, 215.

Want to keep old mountings but still enjoy all the advantages of new NEMA ratings? Do it with A. O. Smith integrals! Optional frame mountings fit old NEMA sizes 203, 204, 224, 225.

You get these quality A. O. Smith motor features...

SEALED STARTING SWITCH AND ACTUATOR

Exclusive development . . . totally-enclosed in end frame. No need to remove motor from line for switch service.



DRIP-PROOF CONSTRUCTION

Motor can be mounted in any position . . . drip-proof thru 360° cycle . . . simply rotate end brackets. No foreign matter can enter vent holes.

PRE-LUBRICATED BEARINGS

Shielded bearings assure protection against over greasing . . . provide even load distribution under all working conditions . . . quiet operating.

integral hp motors have

frame mountings to *fit your product specifications*...

with either *new* or *old* NEMA dimensions.

THERE'S no need to change product design or manufacturing processes to enjoy all the advantages of new NEMA specifications for integral hp motors. A. O. Smith offers you motors with optional frame mountings — either the old specifications or the new.

Optional frame mountings for integral hp motors is one of the features used by A. O. Smith in "Application Engineering" motors to your particular design requirements. There's no need to adapt your product to the design limitations of a conventional motor.

Whatever your speed or design requirements, there's an A. O. Smith integral hp motor available to power your products. Integrals are built in single and polyphase . . . in various speeds and frequencies . . . choice of frame mountings for either old or new NEMA dimensions . . . C and D flanges with special flanges as required . . . 1 thru 150 hp.

Produced by one of America's great industrial concerns, these motors are backed by a national network of 270 strategically located factory service stations.

There's one near you — ready to provide 24-hour action on all parts and service orders.

For more information on A. O. Smith integral hp motors, write for new Bulletin No. EM156.

Through research ... *a better way*

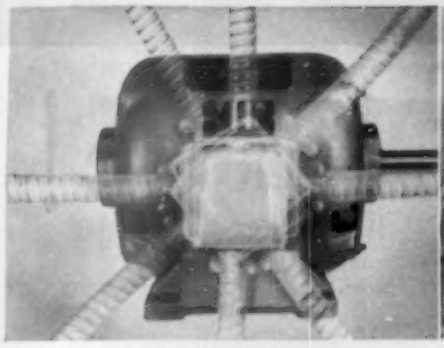
A.O.Smith

CORPORATION

TIPP CITY, OHIO

International Division: Milwaukee 1, Wisconsin

application-engineered to match your product requirements

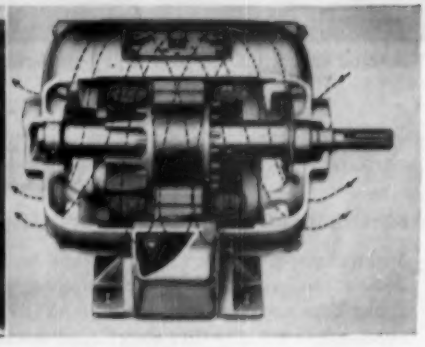


FULL-ROTATING CONDUIT BOX

Can be set at any angle. Designed to save motor space and speed installation. Loosen only three screws to rotate conduit base.

DYNAMICALLY-BALANCED ROTOR

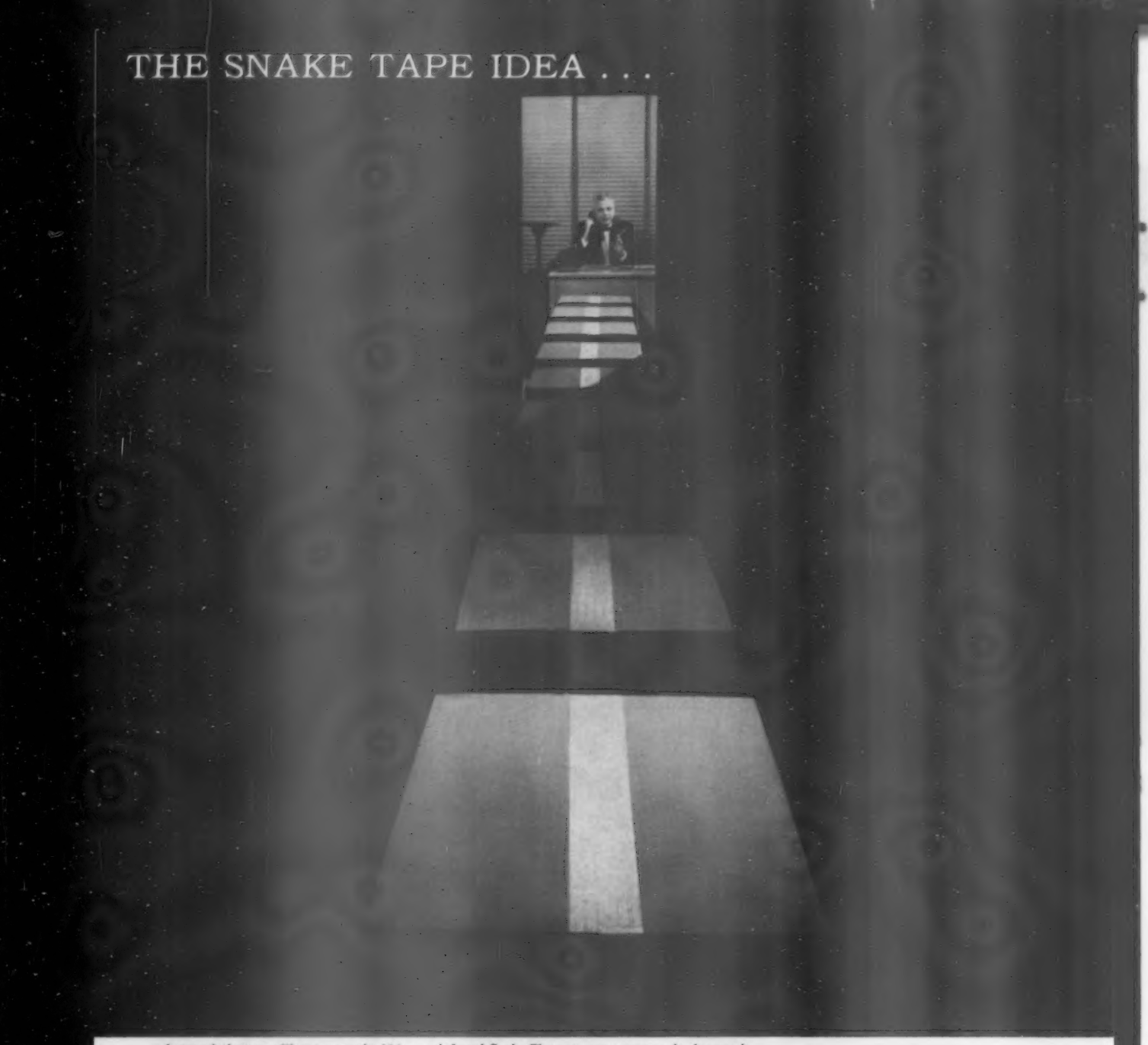
Assures continuous, vibrationless, trouble-free performance and maintains long bearing life. Indestructible laminations are high-quality silicon steel.



CONTROLLED THRU-VENTILATION

Cooling system designed for high-volume, low velocity air for maximum heat transfer. Temperature held to absolute minimum, assuring longer insulation life.

THE SNAKE TAPE IDEA . . .



A trend that you'll see grow in '56 — *reinforced Snake Tape on center seams only, because it . .*

seals cartons stronger in 1/3 the time !

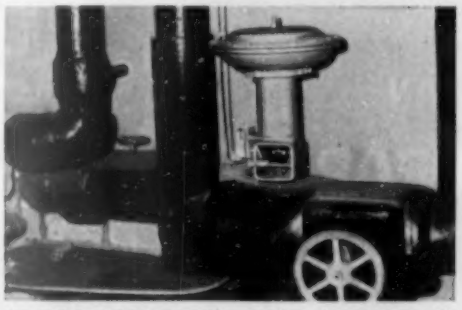
Start cutting next year's costs now by looking into the Snake Tape Idea today.

Sealing cartons with two strips *triples the hourly output* of your shipping room if you now close all seams. Because reinforced Snake Tape is so strong your cartons can take more abuse, as test after test prove. Snake Tape's reinforcing yarns are RAYON — they *absorb* shock just as rayon-reinforced auto tires absorb road shock.

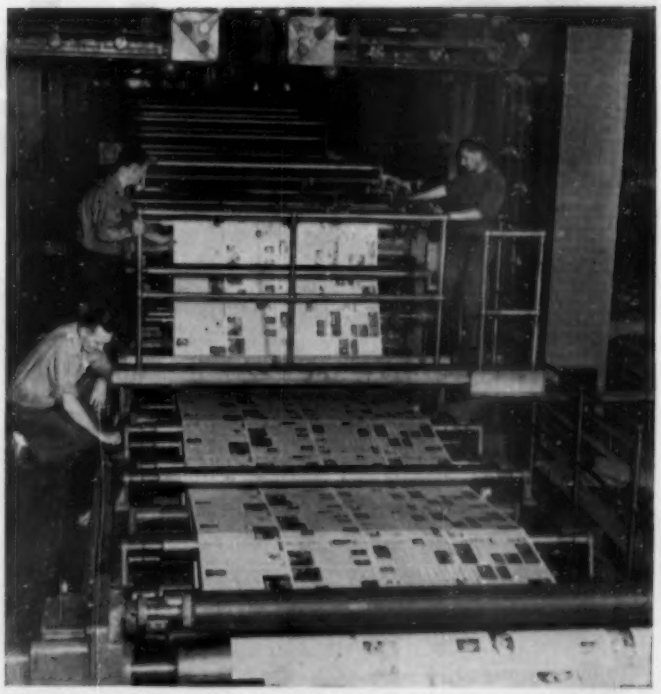
A FREE sample roll and all the facts are yours for the asking. Snake Tape is water-resistant, comes in six widths, and offers low cost publicity for your trade mark or name if you choose.

Write: **ANGIER CORPORATION**, Framingham 1, Mass.

Rotogravure Building, Triangle Publications, Inc., Philadelphia. Albert Kahn Associated Architects & Engineers, architects and engineers, Detroit; Eggly-Furlow Engineers, mechanical engineers, Philadelphia.

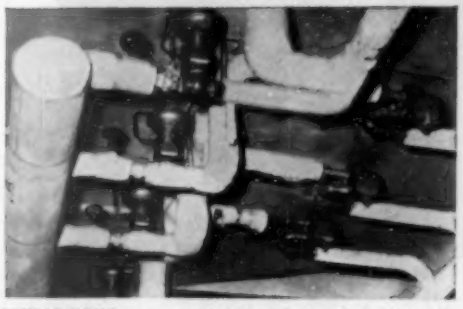


AIR CONDITIONING. A Johnson 3-Way Mixing Valve, with Pilot Positioner, gives precision control of chilled water supply to a unit serving a processing area.



HEATING and VENTILATING. Strategically located Johnson Thermostats regulate heating and ventilating systems for huge press rooms housing 61 giant, high speed press units. Johnson Humidostats closely control relative humidity also.

INTRICATE CONTROL PROBLEMS CORRECTLY SOLVED by JOHNSON



REHEAT COILS are controlled by Johnson Steam Valves in response to demands from Room Thermostats. Pilot Positioners provide maximum, accurate repositioning power.

SOLVENT RECOVERY SYSTEM receives vapor-laden air at rate of 1500 cfm from each press unit. Johnson Static Pressure Regulators and Damper Operators help insure safe air movement through enormous duct system.

Triangle Publications' impressive Rotogravure Building is one of the largest and best equipped gravure plants in the world.

Dependable control of temperatures and humidities is essential in an operation this size. Processing requirements, product protection, worker comfort, safety and operating costs are among the complex factors which must be resolved correctly.

A Johnson-engineered Control System, in command of 25 central heating, ventilating and air conditioning systems, solves all of these problems with precision, satisfying the exact needs of such diversified spaces as press rooms, paper storage, etching and developing rooms, private and general offices and cafeteria.

In addition, other Johnson controllers are applied to the solvent recovery, waste paper pneumatic conveyor, paper handling, ink handling and exhaust systems.

How about your control problems? Whether they involve a simple application of one or a few controllers, or the installation of an intricate temperature, humidity or process control *system*, look to Johnson for the correct answer. An engineer from a nearby Johnson branch will gladly give you his recommendations without obligation. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON CONTROL

TEMPERATURE ↕ AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

NOW it's 5 to 9!

. . . AN IMPORTANT TIME FOR USERS OF BEARING BRONZES

Asarcon Continuous-Cast Bearing Bronzes are now available in new, larger sizes from 5" to 9" in diameter

Asarco now offers continuous-cast bronzes in 32 new sizes from 5 inches to 9 inches in diameter, supplementing established sizes up to 5 inches in diameter.

You can buy Asarcon Bronzes cored or solid *in the exact length you need.* You pay for no short-end scrap because there are none of the remnants you get from conventional 12-inch or 13-inch lengths.

Diameters of Asarco Continuous-Cast Bronzes now range from ½ inch to 9 inches in any size you need . . . many foundry alloys and a variety of shapes are available in all of these sizes. The famous "Asarcon 773" Bearing Bronze (SAE 660) can be shipped promptly from stock.

All bronzes produced by the patented Asarco continuous-cast process are metallurgically superior. There are no blowholes or porosity, no dross or dirt inclusions.

Write to us for more details, or get in touch with your nearby distributor of Asarco Continuous-Cast Bronzes.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana

WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco

IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

What this change did . . .

Masonry Contractor: A. H. Maxted

Owens-Illinois Glass Block* eliminated the problem of glare, cut maintenance costs, reduced transmission of solar heat

Accurate reading of test results and maintenance of fairly uniform temperatures are necessary in many of the research projects conducted at the Whittier, Calif., Research Laboratory of THE FLUOR CORPORATION, LTD.

That's why ordinary flat glass has been replaced with panels of Owens-Illinois Glass Block. The light-directing and insulating properties of glass block make them a natural solution. Glass block are also virtually maintenance free.

With panels of glass block, daylight is directed upward and diffused over all parts of the rooms all day long. Brightness is kept at comfortable levels, excessive glare and harsh contrasts are eliminated. Owens-Illinois Glass Block insulate so efficiently that it is easier to closely regulate room temperatures.

If you are in the process of remodeling old structures, or building new ones, don't overlook the positive advantages—maintenance economies; better seeing conditions—that panels of Owens-Illinois Glass Block bring. For complete information write Kimble Glass Company, subsidiary of Owens-Illinois, Dept. FM-12, Toledo 1, Ohio.

**Formerly known as INSULUX*

BEFORE
Owens-Illinois Glass Block

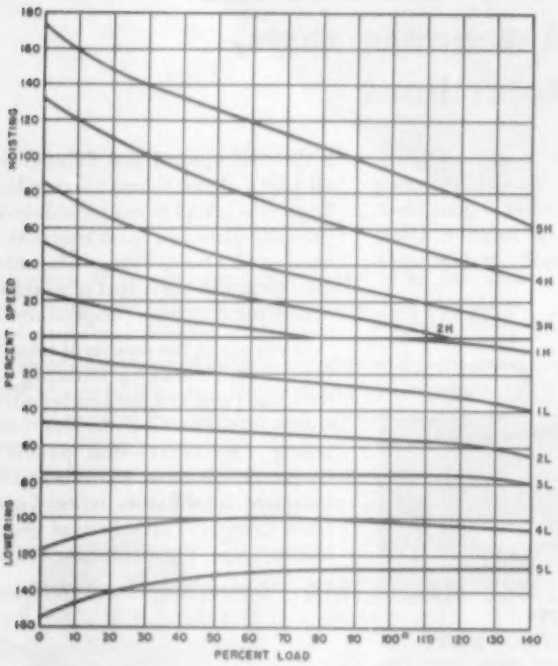
AFTER
Owens-Illinois Glass Block

OWENS-ILLINOIS GLASS BLOCK
AN (O) PRODUCT

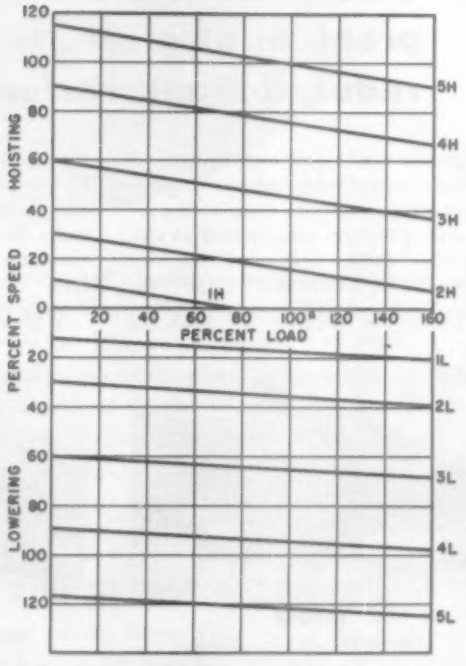
OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

PINPOINT ACCURACY of hoist equipped with G-E Speed Variator drive helps cut cost, speed scrap handling at Northwest Steel Rolling Mills, Inc. Only routine maintenance has been required on the drive in 1½ years of rugged, tough service. Compact construction of packaged power unit, visible above cab, saves space in limited bridge area.

Easily-installed G-E hoist drive

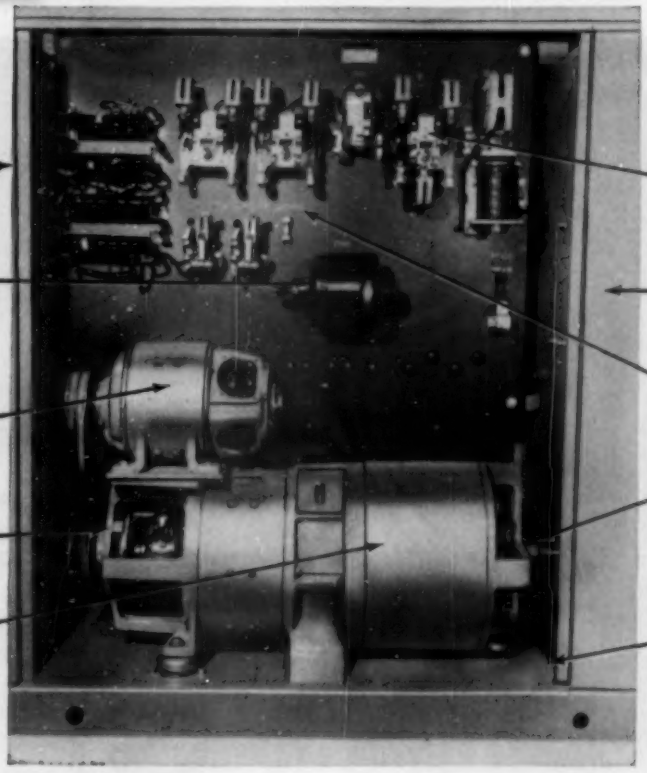


FAST EMPTY-HOOK SPEEDS to help boost yard output can be obtained by using a compound wound hoist motor with the basic G-E Speed Variator.



RELATIVELY FLAT LOWERING CURVES through use of shunt wound motor make G-E Speed Variator ideal for jobs requiring accurate positioning for wide range loads.

*100% load corresponds to rated motor current hoisting.



1. **Compact,** "packaged" power unit permits versatile mounting on crane equipment, requires fewer conductor leads.

2. **Smooth,** fast response to operator's control is provided by damping motor which prevents shock to cables and gears.

3. **Double belted,** oversized exciter provides ample excitation power for generator field, drive motor field, d-c control, and magnetic brake.

4. **Large openings** in end shield permit easy inspection of brushes and commutator.

5. **Powerful,** dependable motor generator set meets rugged duty cycle of crane and hoist equipment.

6. **Designed** for easy maintenance, most components are mounted on front of panel.

7. **All a-c components** protected in separate end compartment.

8. **All devices** identified for quick recognition, easy servicing.

9. **Pressurizing fan** and air filter system help keep unit free from dirt and dust. Filters easily replaced.

10. **For easy access,** pull-out pins on cabinet door hinges allow door removal without full swing out. Lift-off type doors are also available.

10 ADVANTAGES BUILT INTO THE G-E SPEED VARIATOR POWER UNIT FOR HOIST DRIVE APPLICATION

gives high-speed crane operation

Speed Variator drive offers faster, smoother performance, reduced maintenance

General Electric's Speed Variator hoist drive has been designed with the performance characteristics needed to provide fast, efficient movement of materials in your operation.

CONSTANT LOAD SPEEDS, relatively unaffected by load weight, enable the crane operator to pinpoint even the heaviest loads. By offering quick, smooth response, and fast empty-hook speed, the G-E hoist drive assures safer, faster, smoother crane operation.

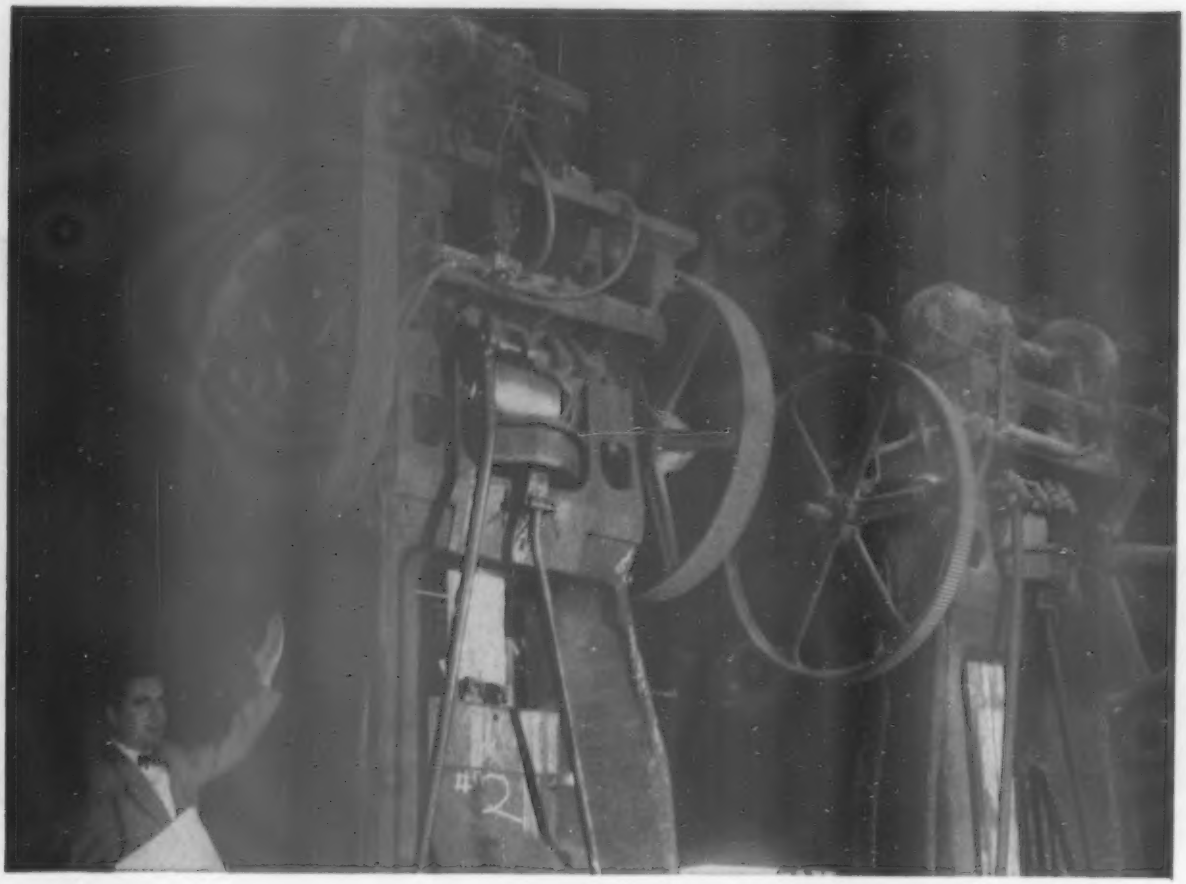
FOR EASY, VERSATILE INSTALLATION, the Speed Variator unit is completely engineered, wired and tested at the G-E factory. When compact power system is mounted on crane bridge, there are no large resistor banks to install, fewer collector leads are required, and installation time and expense are greatly reduced. In addition, the Speed Variator unit requires minimum space in limited bridge area.

ONLY ROUTINE MAINTENANCE CHECKS have been required in 1½ years service on G-E hoist drive installed at Northwest Steel Rolling Mills, Inc., Seattle, Washington (photo above, left). Smooth acceleration and deceleration of drive eliminate load shock and prolong life of cables and gears. Long brake life is also assured because load speed is decreased electrically before brake sets. Pressurized Speed Variator cabinet has large front and rear doors for easy inspection, and air filters protect power unit from dust and dirt. The many advantages of the G-E hoist drive add up to efficient, low-cost materials handling.

FOR MORE INFORMATION, contact your nearest General Electric Apparatus Sales Office. A specialist will give you the complete story on the G-E hoist drive—the drive that is factory tested, co-ordinated, and adjusted for optimum crane performance. 8159

DIRECT CURRENT MOTOR AND GENERATOR DEPARTMENT, GENERAL ELECTRIC COMPANY, ERIE, PENNSYLVANIA.

GENERAL ELECTRIC



SAM RAUDEBAUGH, sales engineer for Ohio Belting and Transmission Company, Worthington distributor, checks installation of V-belt drive at Dana Corporation's Toledo Division.

V-belt drive hammers home 15% production increase

Worthington distributor solves problem and reduces customer's maintenance costs from $2,500 to $10 a year

That's the report, after a year and a half of operation, on the Worthington Multi-V-Drive installed in place of a costly gear drive on a board hammer at the Toledo Division of the Dana Corporation, Toledo, Ohio.

The old drive just couldn't take the shock loads the hammer was handing out in the auto part forging operation. Gear teeth and shafts kept giving way. The result: a $2,500 yearly maintenance bill plus production loss due to downtime. After looking at these figures, Dana engineers talked to Ohio Belting & Transmission Company, Worthington distributor, who recommended a new Worthington V-belt drive with Worthington QD sheaves, Worthington-Goodyear V-Belts and a tension-control motor mount.

Breakdown troubles vanished. Total maintenance cost in the first year: $10! That was proof enough for the Dana Corporation; they're changing over the 15 remaining hammers to the same kind of drive.

Find out how the Multi-V-Drive combination of Worthington QD sheaves and matched Worthington-Goodyear V-belts can work for you. Get in touch with your nearest Worthington distributor — or write Worthington Corporation, Mechanical Power Transmission Division, Section MV.5.28, Oil City, Pa.

MV.5.28

WORTHINGTON

BUY THESE WORTHINGTON STANDARD PRODUCTS FROM YOUR LOCAL DISTRIBUTOR

Compressors • Pumps • Multi-V-Drives • Variable Speed Drives

IN POWDER METALLURGY . . . IT'S AMPLEX

The Bearing That Wouldn't Wear Out

125 years service without adding a drop of oil*

How long will a bearing last? An OILITE customer making large vertical shaft attic fans wanted to know the answer. He subjected a fan equipped with an OILITE bronze flange bearing to an *accelerated life test equivalent to 125 years of service. Throughout the test it ran quietly and smoothly. *Not one drop of oil was added—it showed no apparent wear.*

OILITE bearings hold oil by capillary attraction. Oil film on the surface insures positive, constant lubrication. Particularly good in trouble areas where lubrication is difficult or impossible. The built-in oil cushion allows OILITE Heavy-Duty Bearings to absorb shocks and stresses.

Heavy-Duty, self-lubricating OILITE bearings are Chrysler engineered to meet individual requirements. Standard bearings are available from local dealer stocks. Also cores, bars, plates, discs and strips in sizes ranging from ½" to 15¼" I.D. and 1" to 18¼" O.D.

The engineering facilities of Amplex and Chrysler, unmatched in the powder metal industry, are ready to help you with your bearing problems. For on-the-spot service, consult your telephone yellow pages for the field engineer near you.

CHRYSLER AMPLEX PRODUCTS

OILITE Bearings
Permanent Metal Filters
Finished Machine Parts
Friction Units

Write for free 24-page OILITE Bronze Precision Bearings bulletin S-53.

OILITE — *Only Chrysler makes OILITE*

CHRYSLER CORPORATION • AMPLEX DIVISION

Dept. L-12 — Detroit 31, Michigan

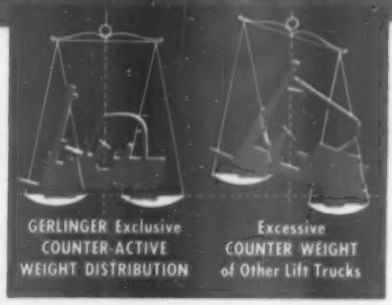
5 reasons why business is UP!

at CONCRETE PIPE CO. OF OHIO INC.

...and they're all JOB PROVED GERLINGERS

The Gerlinger fork lift truck shown here is the *fifth* one for The Concrete Pipe Company of Ohio, Inc., North Randall, Ohio. It seems like only yesterday that the firm acquired its *first* Gerlinger to replace a rented portable crane that required three men full time to operate and maintain. Savings on crane rental paid for Gerlinger No. 1 in less than a year!

Economy was only the start of the story ...Gerlinger *versatility* encompassed the crane function, transporting cumbersome pipe in yards and to kilns...and loading trucks, too. All one-man operations. Gerlingers Nos. 2, 3 and 4 were soon added, boosting production while consistently outperforming any other material handler in the concrete field. Today, Concrete Pipe of Ohio keeps a *fleet of five Gerlingers* profitably busy at both the main plant and the one at Erie, Pennsylvania.



Gerlinger's COUNTER-ACTIVE WEIGHT DISTRIBUTION scores with operator John F. Miller (photo) who captained the 1954-55 Ohio State basketball team. This exclusive feature eliminates the common problem of varying load widths and weights.

GERLINGER CARRIER COMPANY
DEPT. CP • DALLAS, OREGON

Please send FREE Gerlinger Fork Lift Catalog showing how Gerlinger can lower costs in my materials handling operation.

Name_____

Firm_____

Street_____

City_____

Zone____ State_____

GERLINGER PRODUCTS

G-469

DE LAVAL
OPPELLER PUMPS

last longer... cut maintenance costs

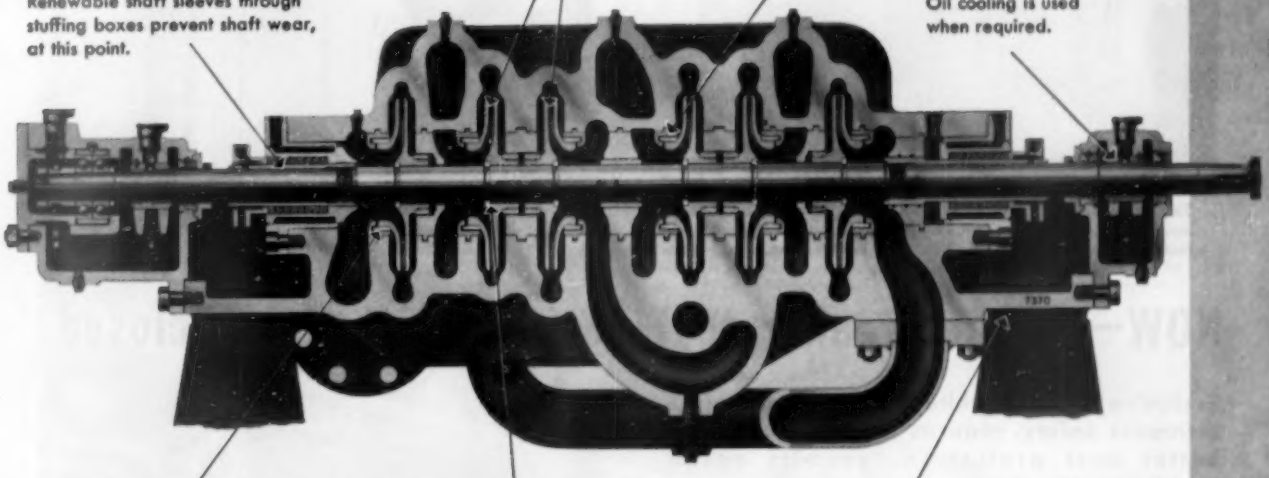
Stages are arranged to reduce differential pressures between stages. This insures permanent sealing at the casing-joint and at interstage diaphragms.

Pairs of back-to-back impellers balance axial thrust. One-purpose thrust bearing carries no radial load, maintains axial alignment.

Labyrinth wearing rings permit safe clearances and reduce wear.

All bearings are ring-oiled, sealed against contamination by water or dust. Oil cooling is used when required.

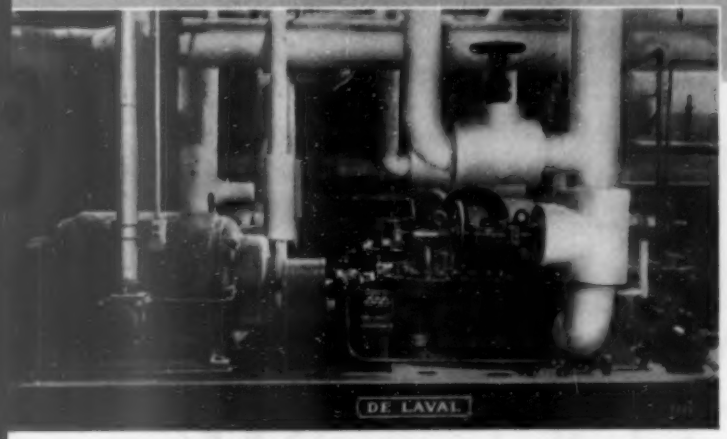
Renewable shaft sleeves through stuffing boxes prevent shaft wear, at this point.



Threaded impeller wearing rings make replacement easy without heating or damage to impellers.

Individual impeller mountings, with split locating rings, make interstage shaft sleeves unnecessary. Impellers can't shift with shaft expansion and contraction.

Casing support insures coupling alignment at any operating temperature.



Here are two De Laval 6-stage Oppeller Pumps used for boiler feed service in an industrial installation.

The design features above show clearly why De Laval Oppeller Pumps stay on the line longer and cost less to maintain. These pumps are used for boiler feed, hydraulic systems, descaling spray, mine dewatering, refinery oil pumping and similar services.

De Laval Oppeller Pumps are available in sizes from 2 to 4 inches and 2 to 8 stages; capacities to 1000 gpm, pressures to 1200 psig and temperatures to 3500F.

DE LAVAL *Oppeller Pumps*

DE LAVAL STEAM TURBINE COMPANY

804 Nottingham Way, Trenton 2, New Jersey

DL286

Test position with doors closed now standard on I-T-E low voltage switchgear. This exclusive I-T-E feature is made possible by an extendable escutcheon which permits the operating handle and visual indicator of the breaker to extend through the closed compartment door when the breaker primary contacts are disconnected. Special cutout in side sheet shows breaker within compartment.

NOW—circuit breaker test position with doors closed

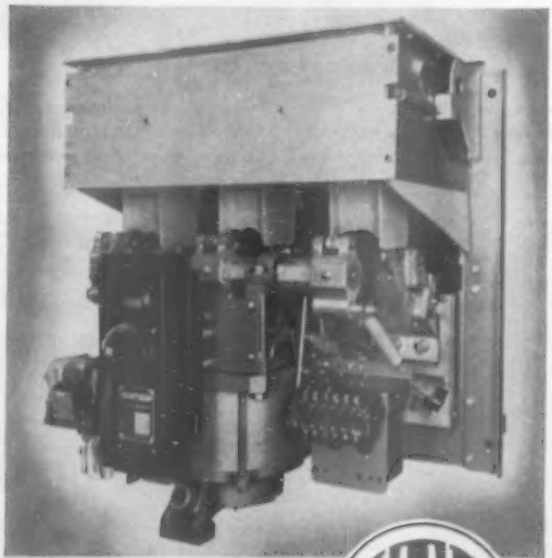
Exclusive I-T-E low voltage switchgear feature increases safety, reduces handling, provides better dust protection, permits easier circuit identification

Consider the many advantages of testing circuit breakers with compartment doors closed or of leaving de-energized breakers in their individual compartments protected against dirt and damage during installation and shutdown. Consider, too, the simplification of maintenance, inspection and "tagging out" of circuits during normal operation. They are all yours in the modern, compact design of the new standard I-T-E Low Voltage Switchgear—at no increase in cost.

New compact KD and KE circuit breaker design saves space

With the addition of the new KD and KE breakers, the line of K type breakers is complete through 4000 amp continuous, 100,000/150,000 amp interrupting @ 600/240 v a-c. Considerably smaller than their predecessors, Types KD and KE circuit breakers fit into three-high and two-high compartments respectively. This saves space, permits instrumentation in the same frame. In addition, the broadening of breaker interrupting ratings—now approved by NEMA—reduces switchgear costs by permitting the application of smaller size circuit breakers for short circuit protection on 240 v a-c and 480 v a-c systems.

For complete information, contact your nearest I-T-E sales office. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.



New Type KD circuit breaker typifies the latest design which extends the range of ratings of the I-T-E Type K family of breakers.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

Rolling Steel Doors

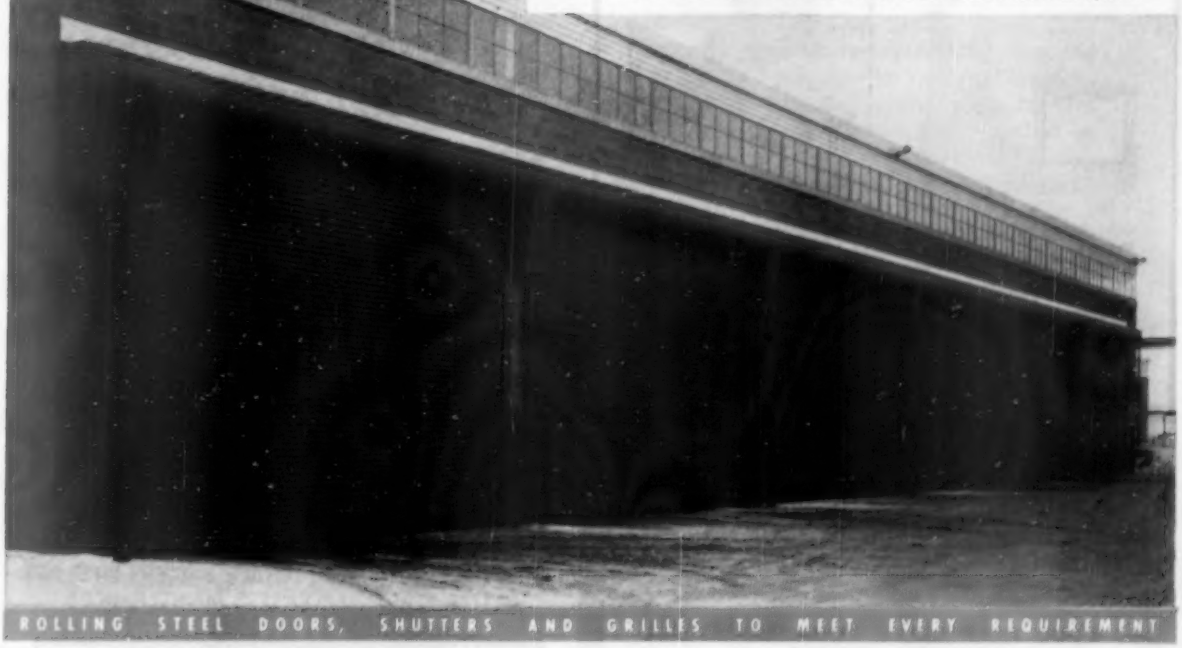
Manually, Mechanically, or Electrically Operated

If you want real protection, long life, and convenient, timesaving operation, you can't beat the quick action of a good power operated rolling Steel Door. No other type of door can match their compactness in operation . . . the vertical roll-up action of the door curtain occupies no usable space either inside or outside the opening—and, there are no overhead tracks or other obstructions to interfere with material stacking or crane handling adjacent to door openings. A quick-opening, quick-closing Mahon Power Operated Rolling Steel Door will save valuable space and valuable time in any type of opening. In addition, Mahon Rolling Steel Doors are permanent—their all-metal construction assures a lifetime of trouble-free service, and provides maximum protection against intrusion and fire. They require less maintenance, too, because, when the door is open, the interlocking steel curtain is rolled up above the opening safe from damage. When you select a Rolling Steel Door, check specifications carefully . . . you will find extra-value features in Mahon doors—for instance, the galvanized steel material, from which the interlocking curtain slats are rolled, is BONDERIZED and DIP-COATED with synthetic enamel which is baked on at 350° F. prior to roll-forming. You will find other Mahon features in both design and materials that add up to a greater over-all dollar value. See Sweet's Files for complete information, or write for Mahon Catalog G-56.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales Engineering Offices in New York and Chicago • Representatives in Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Closing Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Insulated Metal Walls and Wall Panels; Steel Deck for Roofs and Partitions; Permanent Floor Forms, and Electrified Cel-Beam Floor Systems.



ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Six Mahon Power Operated Rolling Steel Doors installed in truck openings of a loading dock in the new plant of Sutherland Paper Co., Kalamazoo, Mich. Miller-Davis Company, Designers and General Contractors. A total of thirty-nine Mahon Rolling Steel Doors were installed in various types of openings in this plant.

MAHON

FACTS ABOUT Exide®

IRONCLAD® INDUSTRIAL TRUCK BATTERIES

WORLD'S LARGEST UNDERGROUND "REFRIGERATOR"

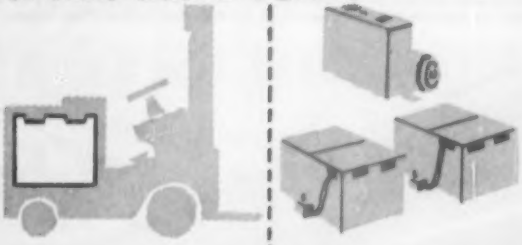
STORES MORE FOOD FASTER...

SAFER WITH EXIDES!

IN AREAS REFRIGERATED TO SUB-ZERO TEMPERATURES A RAPID AND UNIFORM RATE OF MOVING FOODSTUFFS FROM LOADING PLATFORMS TO STORAGE CHAMBERS IS ASSURED BY EXIDE-POWERED ELECTRIC TRUCKS AT NATURAL STORAGE COMPANY IN BONNER SPRINGS, KANSAS. EXIDE-IRONCLADS WORK DEPENDABLY UNDER SEVERE OPERATING CONDITIONS—PROVIDE POWER WITHOUT CONTAMINATING FUMES OR NOISE. EXIDE-IRONCLADS PROVIDE THE SAFEST, FASTEST, LOWEST COST METHOD OF MOVING - STACKING - STORING MATERIALS. EXIDES ARE ALWAYS—

YOUR BEST MOTIVE POWER BUY—*AT ANY PRICE!*

NOW! CASH OUTLAY FOR ELECTRIC TRUCKS CUT DRASTICALLY BY NEW EXIDE PLAN!



BUY ONLY THE TRUCK CHASSIS! CUT INITIAL CAPITAL OUTLAY AS MUCH AS 33⅓%!

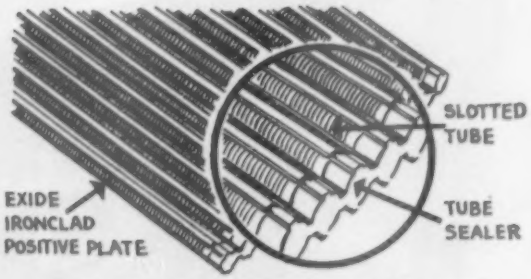
LEASE EXIDE-IRONCLAD BATTERIES AND CHARGER!

IN ADDITION TO THE SUPERIOR OPERATION OF ELECTRIC TRUCKS YOU GET BIG ANNUAL SAVINGS. A TYPICAL EXAMPLE OF HOW MUCH YOU SAVE EACH YEAR WITH ELECTRIC TRUCKS AND THE EXIDE PLAN:

1 TRUCK ON 3-SHIFT OPERATION SAVES $1425.76!

MAKE US PROVE THESE SAVINGS! CALL YOUR EXIDE SALES ENGINEER. ASK YOUR ELECTRIC TRUCK SALESMAN. WRITE FOR COMPLETE DETAILS ON THE EXIDE LEASING PLAN!

MAGIC POWER TUBES OF POLYETHYLENE!



NOW, ACID-PROOF, NON-CORRODING POLYETHYLENE PLASTIC TUBES AND SEALERS ARE INSIDE ALL EXIDE-IRONCLADS! DEVELOPED IN THE LABORATORY, TESTED IN THE FIELD, AND ALREADY PROVED IN CUSTOMER USE - THIS MIRACLE BATTERY MATERIAL IS THE LATEST IMPROVEMENT IN EXIDE-IRONCLADS. ITS USE GIVES YOU MORE POWER IN THE SAME SPACE! LONGER BATTERY LIFE! BETTER PERFORMANCE! LESS MAINTENANCE!

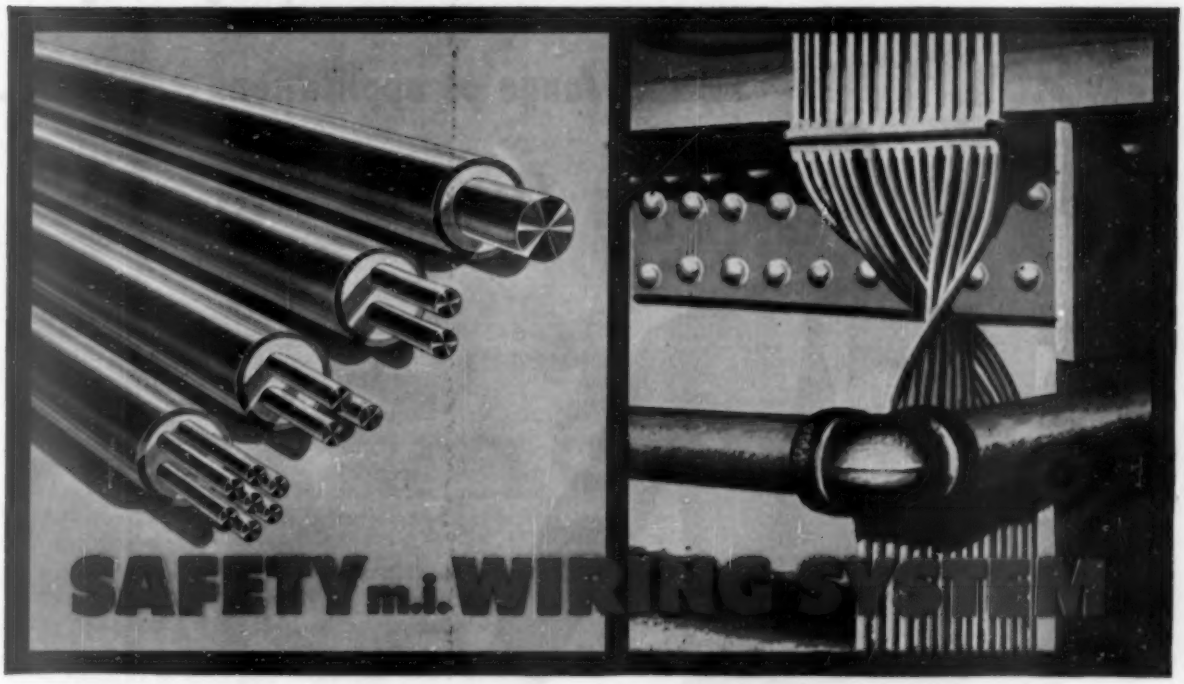
FOR THE AMAZING "INSIDE STORY" ON NEW EXIDE-IRONCLADS WITH POLYETHYLENE, CALL YOUR EXIDE SALES ENGINEER!

LET EXIDE HELP SOLVE YOUR INDUSTRIAL TRUCK BATTERY PROBLEMS. ① CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ② WRITE FOR FORM 1982, A MANUAL ON INSTALLING AND MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE



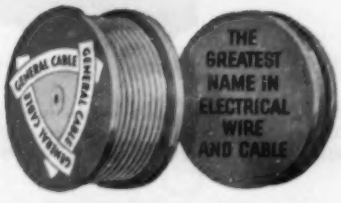
A dramatic new advance in electrical wiring for all applications up to 600 volts and wherever heat, vapors, moisture and aging are problems. Safety m.i. Wiring is ideal for low voltage, lighting, power, control, machine tool and equipment uses.

The mineral insulation of Safety m.i. Wiring is physically stable up to 2800° Centigrade . . . will not burn, deteriorate, support combustion, or convey flame . . . provides extra safety in boiler rooms, around steam pipes, boiler stacks and other "hot spots." Simple fittings seal both ends of wiring runs . . . no possible entrance for moisture.

Underwriters' Approved Safety (Type m.i.) Wiring Systems offers lower installation and maintenance costs. Acts as its own conduit . . . can be installed in one operation with standard switch and junction boxes. Easily shaped on the job, Safety m.i. can be fastened with standard clamps or straps . . . stays put permanently!

Save time and money! Get a neater job! Simplify planning! Ask your General Cable Representative for all the facts about Safety m.i. Wiring Systems. Remember, too, General Cable is the *only* manufacturer who can supply *all* your wire and cable needs!

GENERAL CABLE
CORPORATION



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION
Executive Offices: 420 Lexington Ave., New York 17, N. Y.

SALES OFFICES: Atlanta • Baltimore • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Dayton • Denver Detroit • Erie (Pa.) • Greensboro (N. C.) • Houston Indianapolis • Kansas City • Lincoln (Neb.) • Los Angeles Memphis • Milwaukee • Minneapolis • New Haven • New Orleans • Newark (N. J.) • New York • Philadelphia Pittsburgh • Portland (Ore.) • Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) • St. Louis • San Francisco Seattle • Springfield (Ill.) • Syracuse • Tampa • Tulsa Washington (D. C.)

2 new L. V. circuit breaker frame sizes . . .

new increased interrupting ratings . . .

new range of applications . . . . . .

With L. L. Fountain here are the two new Westinghouse DB breakers for low-voltage power distribution, with interrupting capacity up to 150,000 amperes.

blanket industry's circuit protection needs to 150,000 amperes

1. Two new Westinghouse DB breaker sizes—the DB-75 and DB-100—complete your low-voltage power distribution circuit protection requirements.

2. Interrupting ratings for all five breaker sizes have been increased on 240-volt and 480-volt, nonselective applications (table below).

This means you now get much greater short-circuit and overload protection in the same frame sizes . . . greater interrupting capacity in the same floor area.

3. All Westinghouse DB breakers now are equipped with the exclusive air-delayed overload tripping device with an unexcelled range of optional settings—standard instantaneous and long-time delay with 9 *calibrated settings,* or selective tripping units with combinations of long and short-time delay with *13 settings.* This means, for one thing, that you get a greater variety of switchboard and switchgear application possibilities, to meet increasing power needs and changing production situations.

In addition to these new developments, the DB line of breakers incorporates such features as metal bases, individually insulated poles, fully insulated tripping adjustments and maximum accessibility to all components—features that add up to many years of trouble-free circuit protection.

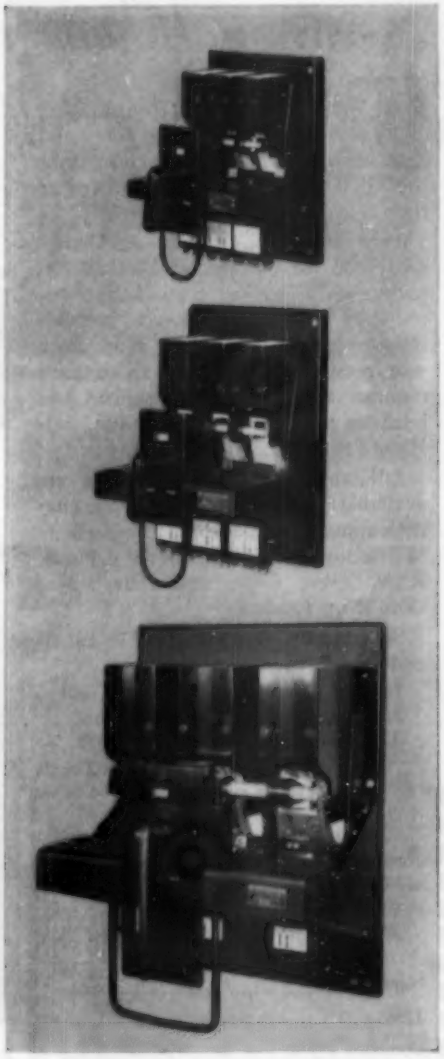
Contact your Westinghouse sales engineer for assistance in circuit breaker application, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60884

Nonselective Application Ratings for DB Breakers

Frame Size	Old Rating	New Rating	
		240 Volt	480 Volt
DB-15	15,000A	30,000A	25,000A
DB-25	25,000A	50,000A	35,000A
DB-50	50,000A	75,000A	60,000A
DB-75	75,000A	100,000A	75,000A
DB-100	100,000A	150,000A	100,000A

YOU CAN BE **SURE**...IF IT'S

Westinghouse



The DB-15, DB-25 and DB-50 circuit breakers, with their increased I. R. and comparable characteristics, cover the lower ranges of current ratings.

Where can you get a sling like this?

More strength at lower cost —with *JalKlamp*

Now J&L can furnish safer, stronger wire rope slings and terminals *at lower cost* thanks to JalKlamp, the new sleeve for wire rope splicing, exclusive with J&L.

The reason: Non-corrosive JalKlamps are made from a special alloy. When hydraulically pressed around the rope, the alloy flows into the spaces between the wires and strands . . . produces a neat, permanent, watertight splice that's stronger than any tucked splice. And because they're machine made, JalKlamp splices cost less.

JalKlamp slings and terminals are available for all standard wire rope constructions and in diameters ranging from ⅛" through 2", with SpringKore, PlastiKore, Fiber Core, and Independent Wire Rope Centers.

Specify JalKlamp slings and terminals and get these features:

1. High Strength
2. Economy
3. Non-Corrosive
4. Water Tight
5. Permanent
6. Neat, Safe, — no jagged ends

Jones & Laughlin Steel Corporation
407 Gateway Center, Pittsburgh 30, Pa.

☐ Please send me a free copy of your JalKlamp booklet.

Name_____

Title_____

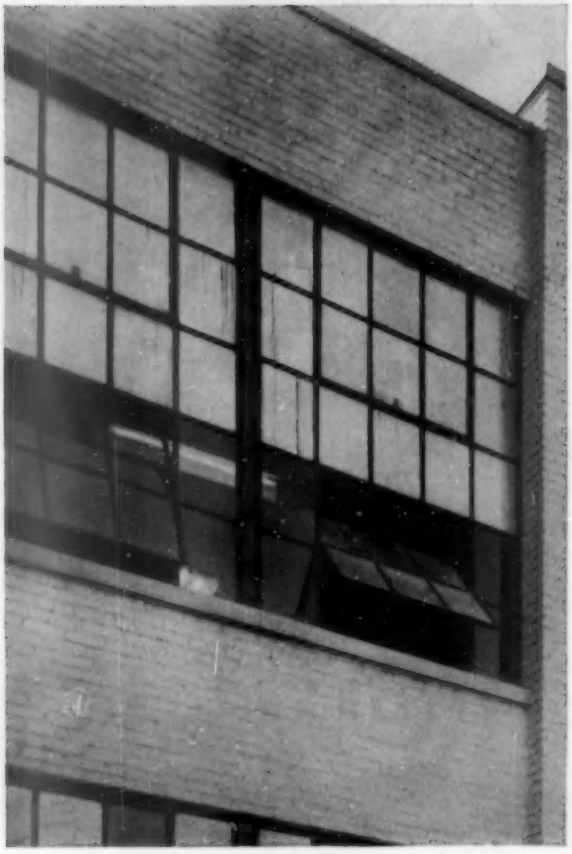
Company_____

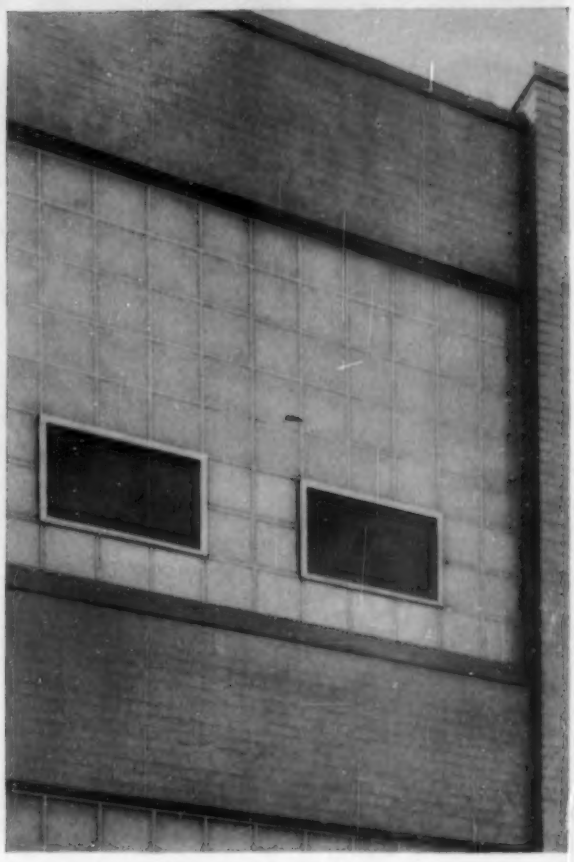
Address_____

City_____ Zone____

State_____

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*





How to eliminate recurring window maintenance

If you have experienced maintenance problems with windows like those at left above, you know only too well that the first repair job is never the last. Encrusted paint blisters and peels. Moisture builds up rust formations and warping and buckling soon follow causing window breakage. Putty loosens and calking pulls away. The discouraging thing is that the repairs, which don't really cure the basic headache, bring only temporary relief from costly maintenance.

Fortunately—as shown in the right hand picture above—there's a sound answer to the problem . . . *modernize with panels of PC Glass Blocks.* Once these panels are installed, you don't have to do anything to them for years. There is no paint to blister and peel—no rust to form—no warping and buckling to cause window breakage—no putty to crack and loosen. And this low maintenance is just part of the story. PC *functional* Glass Blocks are designed to process raw daylight into useful illumination that's easy-on-the-eyes. This *controlled* daylighting bans the need for shading devices and aids worker efficiency and comfort. The high insulation value of a Glass Block panel (equal to an 8-inch masonry wall) lowers heating and cooling costs, and virtually eliminates condensation problems. Last but not least, PC Glass Blocks take years off the age of your building.

The complete story is told in the booklet, *How to Modernize Old Windows with PC Glass Blocks.* Write for your copy. Pittsburgh Corning Corporation, Dept. M-125, One Gateway Center, Pittsburgh 22, Pa. In Canada: 57 Bloor Street West, Toronto, Ontario.

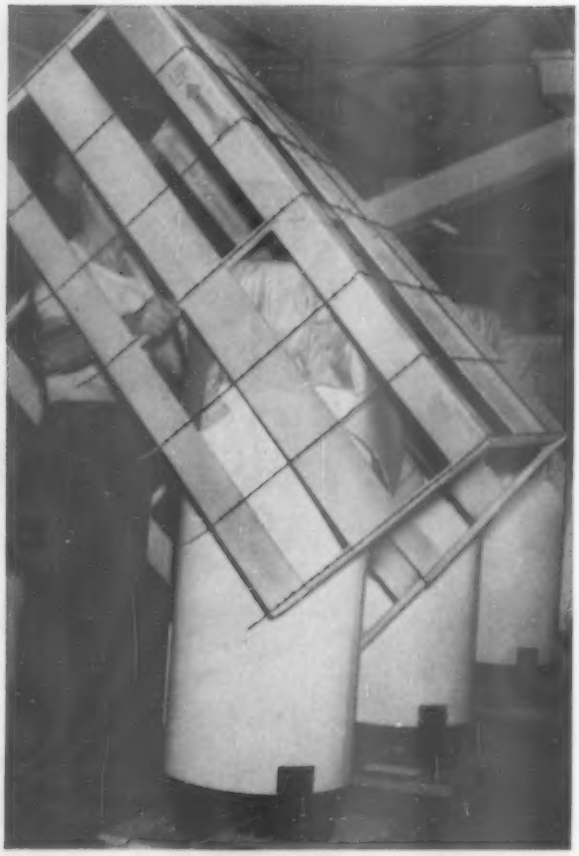
PC FUNCTIONAL GLASS BLOCKS ARE TRUE OPTICAL UNITS

Notice in this cut-away view the tiny internal prisms that throw light up to the ceiling or diffuse it in all directions, depending on the pattern selected. The hand points to a fibrous glass diffusing screen used in certain patterns to further reduce heat and glare.

PC Glass Blocks

PITTSBURGH PC CORNING ® ALSO SKYTROL® AND FOAMGLAS®

This coal circulator weighs 539 pounds. It's assembled on base of wirebound crate. Total man-hours for packing come to just 6 minutes.



Water heater bases are bolted to wirebound crate base before assembly. At this point, only 3 minutes are needed to complete crating.

Appliance maker uses 17 General-engineered wirebounds to cut packing costs on 47 items

Gray and Dudley Co., Nashville, Tenn., obtained the figures on packing and shipping costs using wirebounds designed by General Box Company, and compared these with the costs of making their own shipping crates. The study covered 47 different designs and sizes of electric water heaters, electric and gas ranges, oil circulators, coal circulators, cast iron ranges, army ranges, and their spare parts. Wirebounds won a clean decision.

Comparison was made on the basis of man-hours for packing, shipping weights, and over-all packing costs. In the case of a 539-pound coal circulator, for example, the saving was 80% in man-hours, 10% in shipping weight, and 16% in over-all packing cost.

The assembly and packing operations were integrated to save handling costs; noise and dust were eliminated, and the appearance of the products in transit was improved. The crated products have a Safe Transit O.K., too.

It's easy to find out how much General-engineered wirebounds can save you. Let us send a man. No obligation. Just write General Box.

Factories: Cincinnati; Denville, N. J.; East St. Louis; Detroit; Kansas City; Louisville; Milwaukee; Sheboygan; Winchendon, Mass.; General Box Company of Mississippi, Meridian, Miss.; Continental Box Company, Inc., Houston.

Engineered Containers for Every Shipping Need

Wirebound Crates and Boxes • Generalift Pallet Boxes • Corrugated Fiber Boxes • Cleated Corrugated and Watkins-Type Boxes • Stitched Panel Crates • All-Bound Boxes

General Box

1807 Miner Street, Des Plaines, Ill.

★ ★ ★ ★ ★

Hall Industrial Water Report

VOLUME 3 DECEMBER 1955 NUMBER 6

It Takes a Lot of Water to Process Food

In this 60-billion-dollar-a-year business, Hall helps to keep production up by keeping troubles with water down in plants from Massachusetts to California and from Florida to Washington. Not only the conditioning of water for steam power and steam heating, for cooling and for cleaning and processing, but also the processing of waste water for re-use, requires expert consultation and continuing service.

Maintenance Reduced in Plant Condensate System

Severe corrosion was being experienced throughout the condensate system of an Eastern chocolate manufacturing plant, with periodic replacement of sections of return line. Robert Dow, service engineer in the Boston office of Hall Laboratories, suggested a survey with corrosion test specimens to determine how much the use of Hagafilm® might improve conditions.

Weight losses on the test specimens before treatment revealed corrosion rates in most of the return lines sufficiently high to justify treatment. Simple gravity feed of Hagafilm to the boiler feedwater at the suction side of the boiler feed pump was accordingly started.

During the first three months, old corrosion products loosened by the action of the filming amine occasionally plugged traps and strainers. Then the intervals between maintenance calls lengthened until six months would elapse without a single call for a trap to be cleaned or a corroded pipe fitting to be replaced.

When Bob Dow suggested further tests with specimens to measure the effectiveness of the Hagafilm, plant personnel said they already had all the evidence they needed.

Sweetened Boiler Water Not to Plant's Taste

A call for help reached Hall engineer Robert Hobek from a fruit processing plant in Kentucky. Carryover from a boiler suggested that a slug of sugar syrup had somehow leaked into the condensate return system.

Steam coils used to heat some of the processing vats were immediately suspected, since the vacuum created when the steam was shut off could suck the liquid from a vat through any leak in the coil. A careful check revealed the expected perforation in one of the coils. This was repaired and all other coils were checked.

Most of the cooking was done with jacketed kettles so a drain valve was installed on each steam jacket, to be left open at the end of each day. In the morning the steam inlet valve to each jacket was partially opened and the first condensate running out of the drain valve was checked visually for any color indicating contamination.

Jacketed equipment is now used exclusively in the plant. No further difficulty with the sweetened boiler water has been experienced.

Fungus Attack on Cooling Tower Stopped

A mossy organic growth found in patches above the spray line in the top of their cooling tower was cause for concern to an Eastern food processing plant. Hall Laboratories' representative Jack White hurried samples to Hall headquarters in Pittsburgh for examination.

Out of the laboratory came the report that the damaged wood was infected with the same destructive fungus which had played havoc with a number of cooling towers in the Gulf Coast area, in one instance to the extent of $100,000 a year for replacement of wood.

Quick direct treatment of the wood was necessary. Hall engineer Ed Stewart arranged to have the plant personnel spray the cooling tower three times in a month with a trichlorphenate compound, soaking the wood thoroughly each time. An inspection then showed no signs of fungus attack in the zone where previously it had been severe. The plant has continued to spray the tower periodically with excellent results. No sign of fungus attack has yet appeared on a test board installed in 1953.

Plants which are not able to shut down periodically for spraying can protect the wood for prolonged periods by treating it successively with two water-soluble chemicals which interact to form a precipitate with fungicidal properties deep within the wood.

Hall Helps Hams

Hottest development in the curing of hams is an invention by G. O. Hall of Hall Laboratories described in U. S. Patent 2,513,094, now being developed commercially by Calgon, Inc., under the trade-mark Curafos.® By the properly controlled use of complex phosphates in the pumping pickle injected into the ham to produce the cure, the meat will retain its attractive color even when sliced and exposed to fluorescent lights at retail meat counters.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Use it wisely.

Hall Laboratories, Inc.—Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

frame it with DEXION!

New "DO-IT-YOURSELF" framing material has scores of applications in your plant

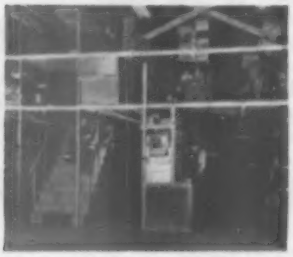
TESTING BENCH

STAIRWAY

WORK BENCH

MAINTENANCE PLATFORM

STORAGE BINS



MEZZANINE FLOOR

GOODS CART

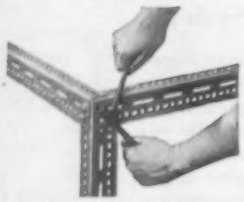
FRAMEWORK CONVEYOR

DEXION Slotted Angle is a packaged product, ten pieces to a package, each piece 10 feet long. There are three types, with dimensions of 3" x 1½" x .080"; 3" x 1½" x .104"; 2¼" x 1½" x .080".

Easy to store. DEXION package occupies approximately 1 cubic foot of space.

Here's why you'll want DEXION Slotted Angle over any other framing material

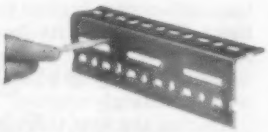
Anyone who can handle a wrench and a saw (or Dexion Cutter) can build with this precision-made, galvanized steel angle. And DEXION is so easy to use or re-use! There's no drilling—no welding—no waste. DEXION is strong and rigid—lasts a lifetime—and the price is amazingly low.



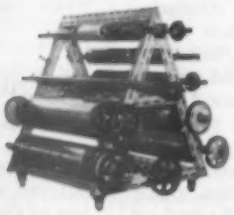
Simple to connect. All you need are two wrenches. No special parts—no training necessary.

Easy to cut. One down-stroke of DEXION cutter saves time and work.

Re-usable. You can dismantle and rebuild into other equipment.



Easy to measure. Diamond-shaped cutting marks spaced 3" apart.



Strong and rigid. Will support many hundreds of pounds.

DEXION panels. Available for shelving to support heavy loads.

You name it—DEXION will frame it!

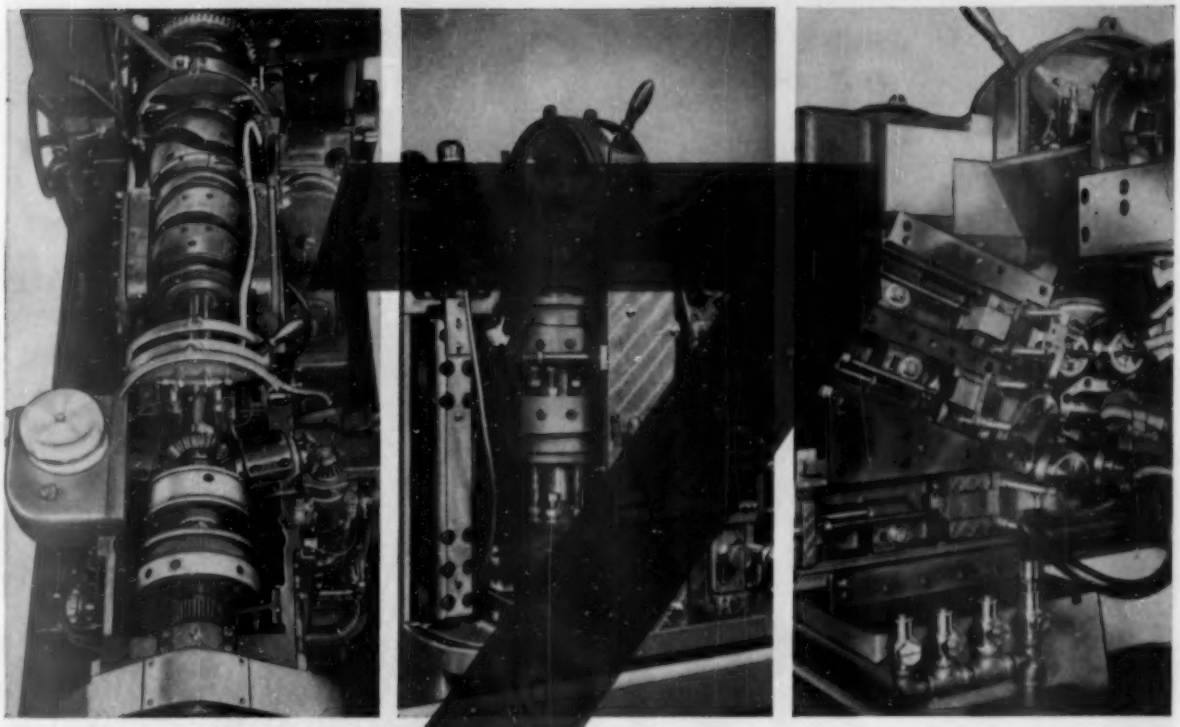
Get the exciting new DEXION IDEA BROCHURE, which gives you full information—and shows what scores of manufacturers are building with this amazing framing material. Write direct to the address shown below.

DEXION DIVISION

ACME STEEL COMPANY

Dept. 12A, 2840 Archer Avenue,
Chicago 8, Illinois

ACME STEEL

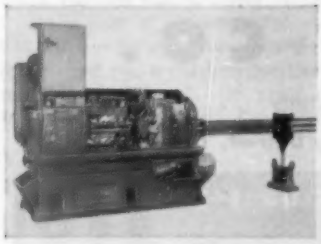


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

Smooth, even finishes are easier with Heller Spiral-Cut Half Round Files. Ordinary half round files require a skillful twisting. Heller engineering has removed this human element from good file performance. The necessary rolling action is designed right into the Heller Spiral-Cut Half Round File. This new cutting principal is typical of Heller's continuous search for better files. By constantly testing, inspecting, improving . . . Heller guarantees file users "the best."

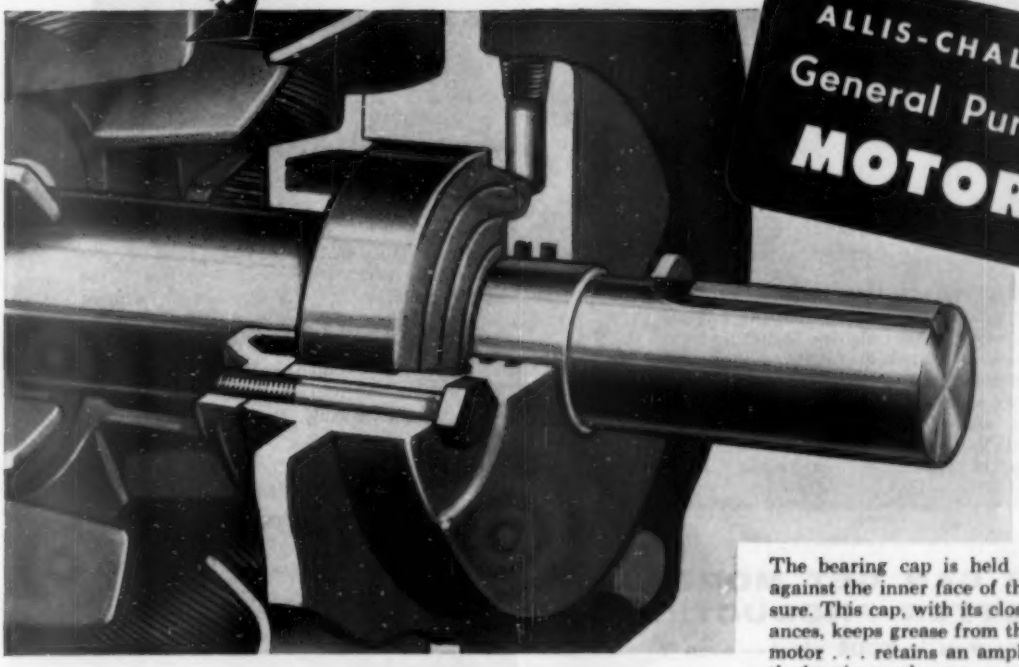
HELLER TOOL CO.

A Subsidiary of Simonds Saw and Steel Company

NEWCOMERSTOWN, OHIO . . . Branch Offices — New York, Chicago, Detroit, Los Angeles

YOUR HELLER DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS

Get Both bearing features



fully enclosed and protected

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

. . . yet easy to grease

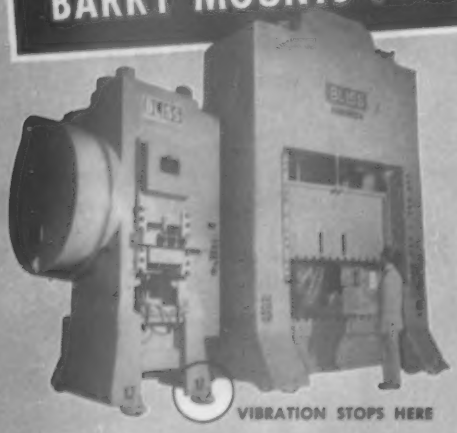
You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6210.

A-4608

ALLIS-CHALMERS

42 MANUFACTURERS *at the Tool Show* PROVED BARRY MOUNTS BOOST PRODUCTION — CUT COSTS



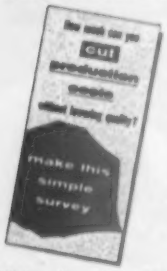
400-TON BLISS PRESS "FLOATS" ON BARRY MOUNTS. With no special foundation, or floor preparation, this knuckle-joint press weighing 26,500 lbs. was installed, leveled, and ready for demonstration in less than 30 minutes. The saving in cost of installation for this and two other giant presses far exceeded the cost of the Barry Leveling Mounts used — with the plus value of freedom from frame stresses met in lagged down installations.

CONSISTENT HIGH-QUALITY PRODUCTION to extremely close tolerances was demonstrated in the Sheffield precision gear grinder exhibit without interference from the pounding of huge heavy-impact presses in adjacent show spaces. With Barry Leveling Mounts isolating the grinders from floor-borne shocks, one operator said, "This machine is performing excellently. I'm getting *no* rejects".

YOU CAN GET MORE and BETTER PRODUCTION

and lower costs in YOUR plant — even if you have problems as tough as any met by machine-tool builders at the Chicago show.

This FREE check-chart shows proved cures for such dollar-eaters as:



- Frozen machine layouts
- Too much downtime
- Machine duplication
- In-line maintenance
- Building-borne vibration
- Slow machine speeds
- Idle space
- Excessive noise

Write for free copy of Barry Plant Survey Chart SA-755 and Product Bulletin 546.

•

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

•

Barry's expansion program offers engineering opportunities at all levels in all departments.

HIGH-SPEED, POWER SHEAR PRODUCTION by Famco was made easy to display by use of Barry Mounts. Installation and leveling was a matter of a few minutes. Then, with day after day operation at up to 85 strokes per minute, the shear did not "walk" . . . while vibration-sensitive lathes and grinders in nearby booths were reported unaffected by the high-speed, heavy impact.

BARRY CONTROLS incorporated **736 Pleasant St. Watertown 72, Mass.**

ENTIRELY NEW...differently NEW

MAINTENANCE-FREE OPERATION

LIGHT WEIGHT
¼ ton model weighs only 51 pounds.

SELF-ADJUSTING HEAVY DUTY BRAKE

OVERLOAD PROTECTION

FULLY ENCLOSED COMPONENTS

SEALED-IN LIFETIME LUBRICATION

ADJUSTABLE SAFETY LIMITS

LOWEST HEADROOM

PUSH BUTTON CONTROL

CAPACITIES from ⅛ to 1 ton.
Single and 3 phase.

$149.50 and up

"CM-Alloy" FLEXIBLE LINK CHAIN

...designed to serve you without costly maintenance

Lodestar is the first truly heavy duty version of the small electric hoist. It is built to serve you without costly maintenance or interruptions in your work schedules. The Lodestar is designed to serve **you**... not to be served.

Fully enclosed construction guards the Lodestar against damage. Sealed-in lifetime lubrication protects it against wear. Special alloys make it rugged. The newest materials, components and design techniques give the Lodestar its stamina, efficiency, simplicity and safety. The initial cost is practically your only cost with a Lodestar...an extremely low cost indeed!

CHISHOLM-MOORE HOIST DIVISION
Columbus McKinnon Chain Corporation
Tonawanda, New York
REGIONAL OFFICES: NEW YORK • CHICAGO • CLEVELAND
In Canada: McKinnon Columbus Chain Ltd., St. Catharines, Ont.

Lodestar®

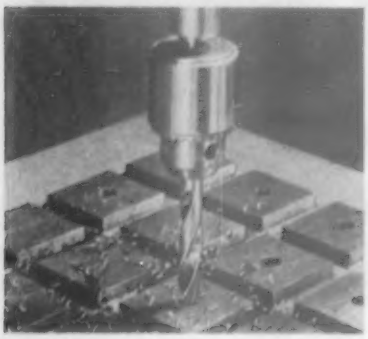
CM
HOISTS AND CHAIN

WRITE US OR CALL YOUR CM DISTRIBUTOR FOR LODESTAR LITERATURE, PRICES AND QUICK DELIVERY FROM STOCK

WHAT'S NEW
IN STEEL FROM STOCK

Now—Leaded Plates

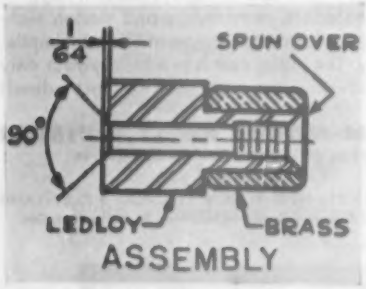
First stocks of leaded steel plates available anywhere are now on hand at Ryerson—and users are reporting results as remarkable as those achieved by thousands of companies with leaded steel bars. Tests show that New E-Z-Cut leaded plates cut faster, take a sounder weld, and polish to a high finish more readily than non-leaded



E-Z-Cut plates. And because sulphur content is much lower New E-Z-Cut is a much cleaner steel, free from troublesome sulphide stringers. First stocks include thicknesses up through 3".

Leaded Bars Make News

Ledloy from Ryerson attracted a good deal of attention at the Chicago Machine Tool Show this fall when three leading machine tool manufacturers chose this amazingly fast-cutting leaded bar steel to demonstrate the efficiency of their latest equipment. For example, the part shown here was machined from Ledloy and assembled with its brass ferrule at a rate of 200 per hour by one tool builder. And at the A.S.M. Show in Philadelphia machining demonstrations showed that the new Ryerson leaded alloy steel Ryeut 40 in-



creases tool life up to 300% over non-leaded alloys in the same carbon range. For more details about these demonstrations, and for many other case studies, call Ryerson—where the nation's largest stocks of leaded carbon and alloy steels are available for immediate shipment.

New Fluid Power Tubing

Another development highlighted at the Machine Tool Show is the tremendous increase in hydraulic power applications. And because of this increase, the new Ryerson stocks of light-wall, pump-cylinder finish cold-drawn WELDED tubing should be of interest to a widening group. The special smooth I.D. of this welded tubing often makes it suitable for use "as-is" in place of more expensive types of tubing which still require extra finishing operations. Also in Ryerson stocks for hydraulic applications: Rockrite cylinder finish tubing and hydraulic fluid line tubing.

New Look for Steel Walls

Give steel-walled buildings new beauty with stainless steel siding in mansard pattern, now available for quick shipment from Ryerson. (Galvanized and carbon steel sheets are also available in mansard pattern.) Unusually attractive, economical in total area lost from pattern formation, maintenance-free stainless in mansard pattern also has many industrial and miscellaneous architectural ornamental applications. For new bulletin 70-5, write Ryerson, Box 8000-A, Chicago 80.

Aircraft Steels Specs

Just off the press, a new booklet entitled "Aircraft Steels" contains latest information, in condensed form, on Aeronautical Specifications—Military (MIL), Air Force-Navy (AN), Federal (QQ-S) and AMS aircraft quality steels. Also included is a complete listing of aircraft quality alloy and stainless steels available for quick shipment from Ryerson. To get your copy write Ryerson, Box 8000-A, Chicago 80, for booklet 93.

Biggest Stainless Plates

Now available from Ryerson stocks: 96" wide plates in thicknesses up through 1", and heavier plates in 80" widths. Types on hand: 304, 304L, 316, 316L. Save welding on next big job with these larger plates.

Carbon Bars, Plates, Shapes

Heavy demand is keeping supply out of balance from a size standpoint. However, we have thousands of tons of steel on hand and new tonnage being received daily. Ryerson stocks remain the world's largest and most diversified.

Joseph T. Ryerson & Son, Inc.

call Ryerson for . . .

STEEL

every kind

in stock

FOR IMMEDIATE SHIPMENT

CARBON, ALLOY AND STAINLESS STEELS
BARS • STRUCTURALS • PLATES • TUBING
SHEETS & STRIP • REINFORCING STEELS
ALSO MACHINERY & TOOLS • PLASTIC PIPE
INDUSTRIAL PLASTIC • BABBITT METAL, ETC.

RYERSON

Plants at: New York • Boston • Philadelphia
Charlotte, N. C. • Cincinnati • Cleveland
Detroit • Pittsburgh • Buffalo • Chicago
Milwaukee • St. Louis • Los Angeles
San Francisco • Spokane • Seattle

Looking Ahead in Business

Some bright business news came up recently. Manufacturers plan to invest in new capacity and modernization at a spectacular rate next year.

If plans reported to McGraw-Hill materialize, they will install $12-billion of new plant and equipment. This is 30% above 1955.

Other types of business firms—commercial, railroads, airlines, communications—also plan to improve facilities, but on a more modest scale. This could account for $33.4-billion of business next year. This is 13% over 1955.

Most significant factor in the picture: All these plans were reported after the Eisenhower illness. Business optimism appears to have endured in spite of the uncertain political situation.

•

The McGraw-Hill survey also indicates that manufacturers have not programed investment as a one-shot operation for next year. About three out of four companies queried expect capital improvement in 1957 to rival or exceed 1956. Confidence appears to have a far horizon.

Confidence cropped out again on sales expectations for 1956. Manufacturing firms as a whole anticipate that next year's volume will be up 7%.

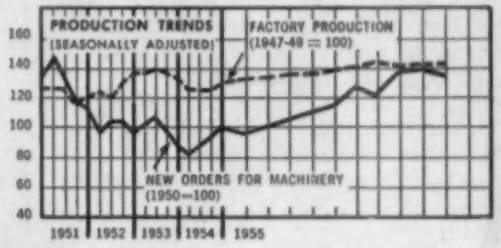
•

The ambitious scope of the plans now on tap raises two questions: Can business do it? If so, what will it mean to the economy in general?

Financially there is no problem even with little idle money around. Pre-tax profits this year will be the best ever. After-tax profits will approach the record. Manufacturing concerns will end up with about $15-billion. Part will be paid out as dividends; the rest, with depreciation funds and some borrowing, will cover the financing. Good profits may be a big reason why so many companies have ambitious plans for 1956.

Materials and labor are a different story. Labor shortages have already developed, especially among skilled workmen and engineers. Materials may be in short supply. Production is at a fast clip now. Output stands at 144 (see chart). And in many industries production is close to capacity.

FACTORY'S FIGURES OF THE MONTH



Indicator	Oct.[p] 1955	Sept.[r] 1955	Oct. 1954
New Orders for Machinery (exc. elec.)[1]	134	140	90
Factory Production[2]	144	144	128
Consumers' Prices (cost of living)[3]	144*	114.9	114.5
Industrial Prices (materials, supplies)[3]	119.0	118.5	114.5
Manufacturing Employment (millions)[3]	16.9	16.9	16.0
Total Employment (millions)[4]	68.2	64.7	62.1
Unemployment (millions)[4]	2.1	2.1	2.7

[p] = preliminary [r] = revised * = estimate

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. U.S. Federal Reserve Board (1947-49 = 100); 3. U.S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 4. U.S. Dept. of Commerce, Bureau of the Census.

Steel, for instance, is operating at around 97% of capacity. Orders are piling up faster than they can be filled. The situation could be aggravated by the industry's plans to improve its own capital equipment. To do this, steel will have to divert current production—needed by almost every industry.

Industrial plant is not the only capital equipment up for refurbishing this year. Government spending on highways, schools, and other public works will be significant, probably ranging $1½-billion more than in 1955.

Most observers expect housing to drop off slightly next year, possibly from 1.3-million to 1.2-million starts. Shortage of mortgage credit will likely be a primary factor here.

What does all this mean to the economy generally? It's a good cushion. If business slows down in other areas, the slack will be taken up by capital investment. A $5- to $6-billion potential increase in investment programs is a sturdy prop to the business outlook. If, on the other hand, business continues to be good, investment plans will make it even better.

Looking Ahead in Labor

You can expect "middle-of-the-road" rulings from the recently completed National Labor Relations Board. When the President picked an NLRB trial examiner, Stephen Sibley Bean, to be the fifth member and elevated member Boyd Leedom to the chairmanship, he gave the Board a "moderate" tone.

This is the third philosophical shift in recent years. Under the Democrats, the Board leaned toward labor, while Eisenhower's first Republican-controlled Board was conservative. Now the line-up is right down the middle:

- Bean, one-time Republican Mayor of Woburn, Mass., has been an NLRB trial examiner for the past 5 years. He was appointed by the Democrats because of a high civil service rating. Both management and union attorneys say he performed that job without leaning to either side.
- Leedom, who came to the Board early this year from the South Dakota Supreme Court, is noted for judicial decisions. He follows the letter of the law in Taft-Hartley rulings. Has won a favorable reputation in both union and business circles.
- In picking Leedom for chairman, Eisenhower bypassed Philip Ray Rodgers who had been serving as acting chairman for three months. Rodgers, a conservative, was in line for the top post. His return to the member ranks is another indication of the shift to the middle-way.
- Rodgers's conservatism is offset by the liberal rulings of Democratic-appointee Abe Murdock, while the fifth member, Ivar H. Peterson, although picked by the Democrats, is a political neutral.

The new Board line-up is a compromise between the philosophies of Labor Secretary Mitchell and Commerce Secretary Weeks. Both failed to push through their first choices for the Board opening left by former chairman Guy Farmer three months earlier. So they settled on Bean.

•

There won't be any major labor legislation. That is almost sure even before the legislators return to work next month. Here's why: Congress is almost evenly divided politically, doesn't lean sharply either way on labor issues. And it's an election year when neither Republicans nor Democrats want to get bogged down in troublesome disputes.

This means you can write off any changes in the Taft-Hartley Act. The Administration will again propose a series of amendments, and labor will have its own set of suggested changes. But the recommendations won't look alike.

The White House and union groups will nevertheless be jointly supporting other labor-related legislation. Both favor congressional action to prevent corruption in handling multi-million dollar welfare funds; you can anticipate a law that will require public disclosure of fund finances.

Also there's joint agreement that Social Security benefits should be raised. A joint effort will be made, too, to design programs to aid chronically depressed areas, particularly in coal mining and textile regions.

•

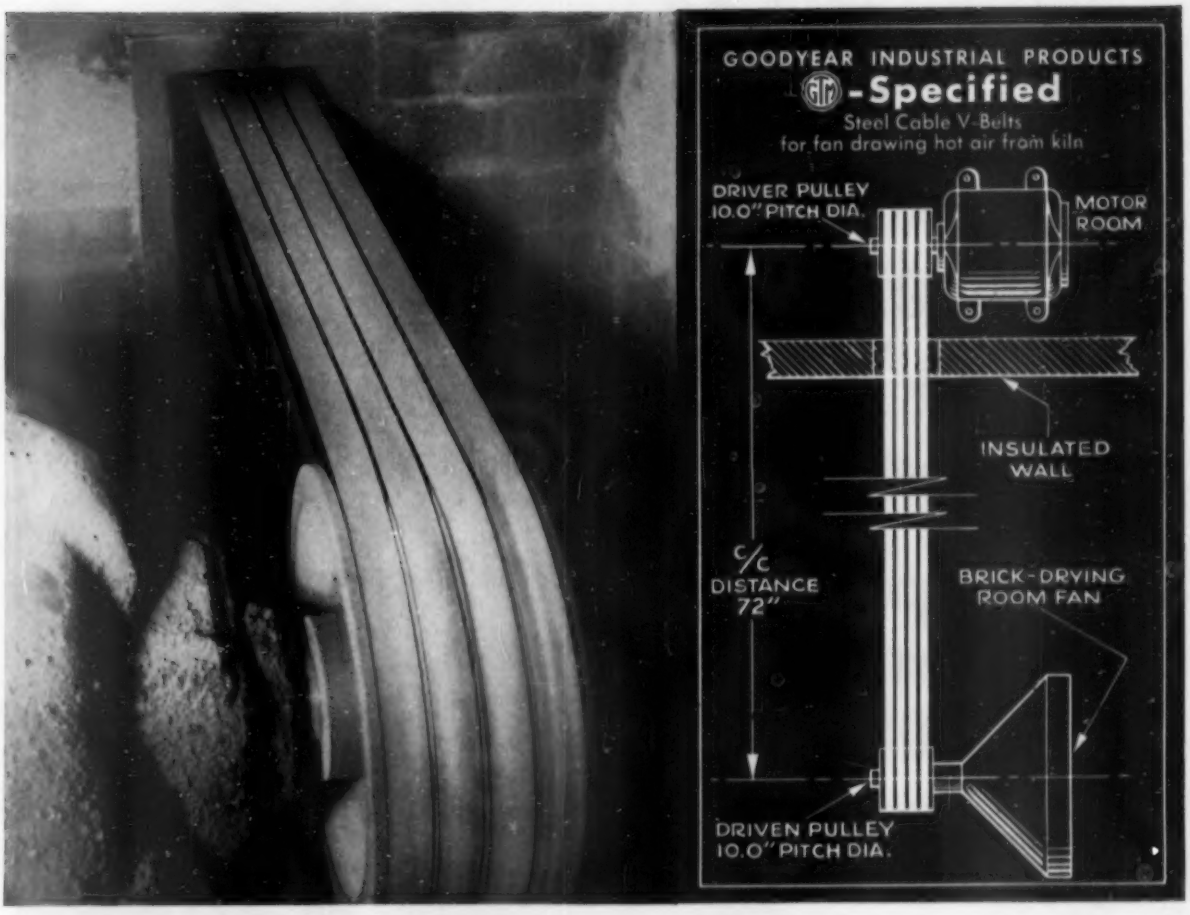
AFL-CIO merger won't settle organized labor's internal problems. It may raise new ones. With the combination of the two federations into a single 15-million-member union now completed, the wraps are off for those unions that opposed the move. Recalcitrant union leaders who held up opposition to allow the merger to go through are ready to speak out—if it becomes necessary.

For example, the powerful AFL craft unions warn that the CIO's industrial unions may try to take over plant construction. If this happens, the AFL unions may withdraw from the no-raiding pact that bars any union from trying to take away members from a rival union. A move of this sort would mean the merger has done organized labor more harm than good.

There are other trouble spots in the picture. Under George Meany's leadership, AFL-CIO is likely to take an active political role in the coming Presidential elections—on the side of the Democrats. This will mean an internal fight with those union leaders who favor the Republicans and who want to keep away from political endorsements.

AFL-CIO headquarters jobs may also bring dissensions. Meany and CIO's Reuther couldn't agree on single candidates for some of the top jobs. So they set up co-directors—one from each federation. Trying to coordinate their ideas, which differ in many cases, will require some active peacemaking efforts on Meany's part.

SEE LABOR RELATIONS NEWS, PAGE 222



Kiln tried and found 7 times better

driving blower fan in 200° heat

TEMPERATURES at a constant 200 degrees plus nonstop year-round operation were the conditions V-belts driving a blower fan pulling air from a brick manufacturer's kiln had to live with. Several types of ordinary V-belts failed after only 8 months' service causing frequent shutdowns and costly replacements.

To solve the problem the G.T.M. – Goodyear Technical Man – was called in. He recommended Steel Cable V-Belts made with load-carrying cables of high tensile steel. The tensile member of these high-strength belts is unaffected by heat. The belts have practically no stretch, are designed for minimum maintenance.

RESULT: The Goodyear belts served 5 years before replacement–7½ times longer than belts previously used. They stopped costly plant shutdowns and, since they did not slip, reduced pulley wear.

If you have a problem drive that's costing you money, call in the G.T.M. for expert help. Contact him through your Goodyear Distributor or write:

Goodyear, Industrial Products Division
Akron 16, Ohio

YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

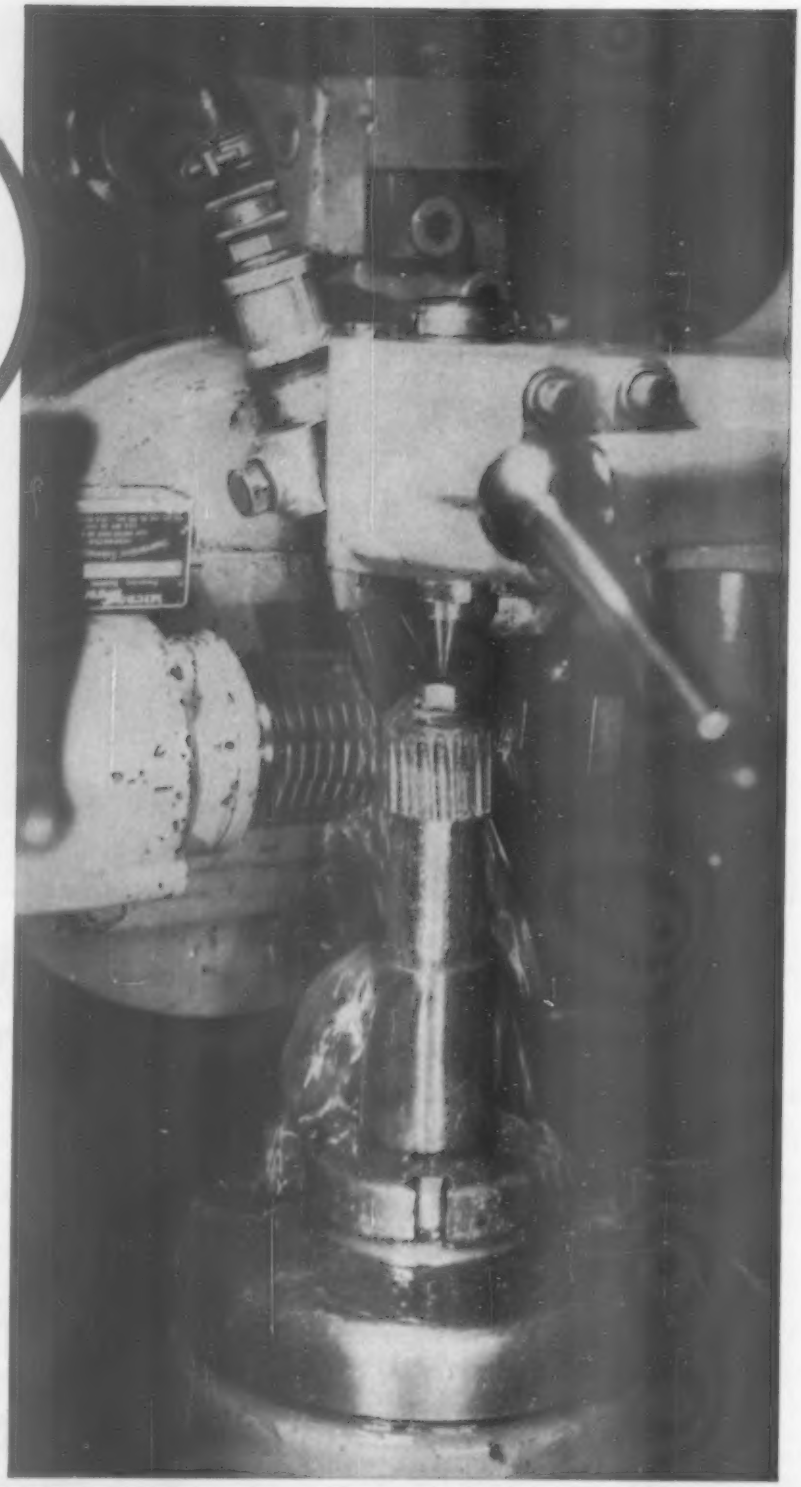
STEEL CABLE V-BELTS by

GOODYEAR

THE GREATEST NAME IN RUBBER

THE TOUGH JOBS GO TO TEXACO

Gear output up from 125 to 500



This gear manufacturer (name on request) averaged only 125 gears between hob regrinds. A Texaco Lubrication Engineer offered to help him do better – recommended using *Texaco Transultex Cutting Oil B.* The change was made. Production shot up to 500 gears between resharpenings – and tool costs on the job dropped 75 percent.

Increased production and lower unit costs are benefits that Texaco can bring to *your* plant.

Made-for-the-job Texaco Lubricants and on-the-job Texaco Lubrication Engineers serve all branches of industry in all 48 States. Put them to work for you.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

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TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Another "Automation Scare" Proves to Be a Dud

BACK IN SEPTEMBER (page 86) we quoted Sen. O'Mahoney (D-Wyo.) as saying: "If automation is to turn workers out on the street, public policy dare not ignore it."

Following up on that pronouncement, a subcommittee of the Senator's Joint Committee on the Economic Report held a series of hearings on automation during October.

Representatives of McGraw-Hill's Washington Bureau and Economics Department attended these hearings. They read the record. And they came up with some conclusions that are rather surprising in view of all the earlier sound and fury about automation. Here they are:

. . . *Automation has aroused little political interest*—if poor attendance by both general public and committee members at the hearings is any indicator.

. . . *No legislation* is likely to result from the hearings.

. . . *Union representatives say they are 100% in favor* of automation and all its benefits; they merely fear its possible ill-effects.

. . . *Everyone agreed* fundamental and substantial shifts are taking place in the nature and distribution of jobs; particularly important is education and retraining of scientific and technical workers.

. . . *The unions made a surprisingly good case for alarm* about technological unemployment. Their primary point: It has been avoided only by an expanding economy.

Frankly, we didn't know there had been much argument of late about the need for an expanding economy. But apparently some of us who want to insure expansion based on sound investment and high real wages rather than false expansion based on inflation of currency have failed to make the distinction clear. We haven't seen many specimens lately of the vanishing breed that claims "a good depression" is a good thing for anybody. The fact is:

Without more and more automation, our chances for a strong, expanding economy are markedly lessened. Automation or no, we're headed for trouble when our economy stops expanding. That's the thing we ought to be scared of.

What Are You Doing About Apprentices?

IT'S EASY these days to view a lot of things with alarm. And sometimes you have to hold back a bit when alarming-sounding statistics are thrown at you.

But here's a comment that certainly ought to make you want to take a look at what you're doing about keeping up the supply of skilled craftsmen needed to take care of our increasingly complicated manufacturing plants and processes.

It comes from Robert W. Conder, Vice President for Industrial Relations for Chrysler Corporation:

"As this demand for skilled mechanics increases and promises to grow much more in the future, the U. S. Department of Labor shows the median age of journeymen has gone up more than 5½ years since 1920. Thirty-five years ago, the median age of all plumbers, electricians, sheetmetal workers, patternmakers, and toolmakers was about 35 years. It was up to 40.5 in 1950."

Mr. Conder goes on to point out this fact: At the same time that our skilled craftsmen as a group are aging, there are fewer young people in the population to replace them. The result is likely to be a growing scarcity of needed skills.

What can we do about it?

Perhaps the most important thing we can all do is assume a more responsible attitude in our individual plants. For too long a time, plant operating men have maintained a "let George do it" attitude toward apprentice training.

It's about time we all took another look and accepted the responsibility to do our share in training young men in the skills we'll be needing more urgently than ever by 1959 and 1960.

How to Get More Out of FACTORY

WE THINK we can offer you a simple suggestion for getting more out of FACTORY—one that will pay off many times over. It's just this:

Take a good look at the Annual Index, bound into this issue (inside the back cover). Then make a mental note to use it next time you have a puzzler to solve.

There are few problems that haven't been covered in the course of a year in FACTORY's life. So chances are better than good that you will find useful answers.

FACTORY's editors have only one job to do. That's to serve you, the reader. So, if you don't find the answer to your problem in the index, let us know. We'll do our best to help.

Write, too, if you want an extra copy of the index. No charge.

Merry Christmas

—The Editors

Building to Fit Your Handling Job

Planning a new plant? Modernizing an old one? Don't give your architect the green light until you've checked ten building points that may bob up later to hamstring every attempt to improve your handling. You'll avoid some costly mistakes.

ARE YOU SPENDING somewhere between 20 and 80 cents of your manufacturing dollar for materials handling? *Sure you are.*

Won't better methods cut your handling costs plenty? *Sure they will.*

Isn't this the perfect set-up for one of your biggest killings of all time? *No, it isn't! Two to one you're stymied in one way or another by your buildings.*

The 2-to-1 odds are based on a FACTORY survey of plants in the Bridgeport (Conn.) area (July 1955, p. 103). We asked this question:

"What are your handicaps in improving materials handling in your plant?"

The answers boiled down to this conclusion:

Two-thirds of all handicaps are building factors —multi-story construction, inadequate flooring, low ceilings, columns too close, and so on.

Now maybe you can't plan and build the perfect plant today. Granted it may develop handicaps to better handling as new products come along, as greater volume is attained, as new equipment is installed, as new methods are developed. *But this you can do!* You *can* cut the odds down to size. You *can* minimize the chance of waking up tomorrow to the realization that certain inherent handicaps are going to block your progress—both present and future.

The way to start is to look upon the building (or buildings) as functional housing for the manufacturing process. That includes everything from raw materials stores to finished-product stocks. It includes all production and service operations—*and the handling that goes with them.*

Your next step is to plan the building details. You want buildings that will provide functionally for efficient, low-cost handling—*now—and as far ahead as you can see.*

And here's the kind of help you'll need to avoid costly mistakes. It comes from the manufacturers of materials handling equipment, who, through the Material Handling Institute, have developed ten building checkpoints for better handling. Here they are:

Check Building Size and Shape

A growing practice is to design the layout of a plant's operations, then plan a building around the layout. Some do it with templates. Others use three-dimensional models. Where height of processes and handling systems is important, 3D models can be worth the extra cost.

Planning location and layout of processing, service, and storage areas before designing the building makes it easier to decide on size, shape, and type of struc-

ture. Besides revealing number of square feet, planning will point out the advantages and disadvantages of multi- and single-story buildings, rectangular and square shapes, low and high ceiling heights.

But a word of caution: Type, size, and shape affect building cost. A square building, for example, is generally cheaper than a rectangular building of equal area. On the other hand, a midwest company found that the extra cost for a higher ceiling paid off. It had planned a 15-ft. ceiling, then found it could get an 18-ft. ceiling for a slight increase in steel and wall cost. The extra 3 feet was a bargain. Better still, it's good provision for future growth.

Point is, it's a good idea to get construction advice while you're planning, or to approach building planning with alternative layouts.

One company pulled this boner! It built a new warehouse four stories high with only three floors inside. The object was to reduce the cost of the building by utilizing higher stacks on three floors. The cost was reduced all right. But the cost of special lift trucks for extra high stacking was far greater than the amount of money saved by skipping a floor.

That wasn't all. Because of the extra-high stacking, truck length and width had to be increased to get sufficient stability when loads were fully elevated. Bigger trucks meant wider aisles to permit right-angle stacking and other maneuvering. *Result:* Total volume of material stored was not as great as it would have been with four floors instead of three.

And this actually happened! Another concern had engineers lay out a conveyor system while the architects were planning the building. *Result:* The conveyor went through a ladies' room!

Check Building Columns

The dream plant would have no columns. Since that would run up building costs sky high, the next best thing is greater distances between columns. And the trend is definitely in that direction. Modern construction methods permit trussing arrangements that preclude multiple columns that hamper the operation of both mobile and stationary handling systems.

This is especially important: Columns should not, when the time comes for actual plant operation, be found to obstruct aisles that have been laid out for easy, efficient flow of material. Nor should they prevent maximum use of storage.

Added considerations for column location include proper spacing to provide aisles, machine areas, and most effective storage. *Ask yourself:* What size packages are going to be handled? They may be wider than truck or materials handling equipment.

Check pillar location in regard to flow pattern of materials within the immediate area and from one area to another. Consider all possible developments and changes that can be thought of.

Don't forget crane load. Maximum column loads will depend upon whether the column is to support the roof and snow loads in addition to the crane load, or crane load only.

First thing to do is decide on column spacing. Girder size can then be figured by using maximum wheel loads and wheelbase, supplied by the crane builder. Add 25% to maximum wheel loads for impact.

For heavy-duty and high-speed cranes, the horizontal forces, both of the trolley moving across the crane bridge and of the crane bridge traveling along the runway, should be taken into consideration when designing girders and trusses.

Just a foot shy! A company that makes washing machines recently built a plant addition for final assembly and temporary storage of crated washers. Too bad! The storage area—a bay between two column rows—lacks one foot of being wide enough to store eight crated washers side-by-side, two to a pallet.

As a result, the space can be used for only three pallet loads across the area, thereby reducing the bay's potential storage capacity by 25%. If design had been correlated with materials handling requirements—*during the planning stages*—maximum storage space would have been assured.

Check Floor-Load Capacities

The trend in new plant building is toward higher floor-load capacities. Probably they'll go higher. That's because machinery is getting bigger. Higher productivity makes material movement per unit of floor space heavier and faster.

Better floor surfaces, too, are more important than ever before. They make it easier to move materials faster, without damage. And the "right" floor means longer life and less maintenance. (For more about the right floor, see FACTORY, May 1954, p. 84.)

The way to get the right floors for your new plant is to tell your architect what you will require of floors and their supporting structures. Otherwise you may expect to get floor-load capacities that are "standard for your industry." What else can he do?

To make sure your floors will serve your materials handling needs, ask yourself these questions—before your architect goes to work:

. . . *What methods and equipment* will you use?

. . . *How much storage load* will you put on floors?

. . . *What will be the volume and frequency* of materials movement?

. . . *How many trucks will be in service?* What will be maximum loaded weight of a truck?

Floor conveyors are often installed flush with the floor. This necessitates pits for the conveyor-drive mechanism. Pits are often installed without any provision for drainage. Come a heavy rain and flooding, there is no way to get water out of pits. Maybe motors are flooded. One plant provided "adequate" drainage only to discover later that the drainage sewer was higher than the drainage point in the pit.

Turn the page

Must you handle 1000-lb. or 10,000-lb. loads? Makes a lot of difference!

Naturally the easiest way to stay out of trouble is to make detailed layout and operating plans for the new building. But some companies have done all this in the most approved manner—and still pulled boners. Why? Because they didn't look ahead. Handling methods and equipment, plant arrangement, storage loads—all will change long before the building is retired. So you must provide for the bigger loads ahead —to the best of your forecasting ability, and consistent with reasonable expenditures for "over-building."

Don't let this happen to you! One plant ordered two fork trucks (costing approximately $3000 apiece) and then found that the floor-load capacity was inadequate. Although a lot of planning and research had been done prior to the purchase, floor-load capacities in all sections of the plant were not thoroughly investigated. In fact, only one floor was checked. It happened to be okay. But in more than half the plant's area the ratings were inadequate.

Check Roof-Truss Capacity

In addition to usual loads, roof-truss capacity must be planned to handle overhead handling equipment that will be used in normal plant operations.

Both client and architect must therefore consider maximum lifts, load weights, and clearances for equipment handling the load. Free movement of overhead handling equipment is important. Layout planning in three dimensions is the best way to avoid interference of machines with overhead handling.

Ordinarily an overhead traveling crane operating on top of runway rails attached to runway girders and supported by suitable columns does not add any undue loads to a roof truss.

Underhung cranes (the kind that operate on the bottom flanges of L-beams, or special track sections) are supported from the bottom of roof trusses or roof beams. The closer the runway beams are located to the building columns, the lower the stresses that are imposed upon the trusses.

If runway beams are to be located a considerable distance from the building columns, with the hoist hook approaching the building wall as close as possible, a longer cantilever of the crane beam beyond the runway beam center is required. The hoist with load at an extreme end of the cantilever will increase the wheel loads. This will materially affect the design of the runway beams.

When underhung cranes are used as transfer cranes, the runway beams should be located to provide sufficient space for crane latch and trolley stops. Also, where a cross-over beam is used between two cranes, the support for the beam should be designed to keep the deflection low. That's necessary to provide a smooth travel surface for the hoist trolley as it is transferred from one crane to the other.

Weight of loads to be handled is also an important consideration. Roof truss design varies greatly with size of loads. The designer must know whether you're planning on handling 1000-lb. or 10,000-lb. loads. Makes a lot of difference!

They forgot to plan for the future! A company needed extra storage space in a hurry. It erected a building that did the job. But in the rush the company's engineers and operating executives gave no thought to the future.

Turned out, a year later, there was need for an overhead handling system in this building. Then—and not until then—it was discovered the roof-truss structure was only strong enough to support the roof and a reasonable snow load.

Changing the structure would have been very expensive. So—no overhead handling.

Check Floor-Truss Clearance

Higher ceilings are one of the significant trends in new-plant design. Why? Overhead handling systems (cranes and conveyors); more tiering of materials, in the shop as well as the warehouse; bigger and taller processing equipment; double-deck operations to conserve floor space (overhead drying, for example); use of height to ease summer discomfort.

Selection of ceiling height is a matter of consideration by the architect and the company's building

planners. The architect can tell how height will affect construction costs. But there are many other factors on which the building planners should advise the building designer. They are:

1. Characteristics and dimensions of the machinery required to perform the operations.

2. The combination of height of machines, fixtures, or other obstructions and the size of loads that must pass overhead by a handling system.

3. Possible future needs for larger machines and new products.

4. Maximum capacity of cranes. Hoisting speed also must be agreed upon, because the physical size of a crane or hoist depends to some extent on its foot-tons output. After capacity and speed are known, a reputable crane builder can provide data on clearances needed.

With these data, distance from floor to top of rail can be determined. The dimension from top of runway rail to clearance line of roof trusses or beams is obtained from the crane builder's clearances.

The problem of trucks that are too high to operate efficiently is an old one. Make sure that trucks will clear sprinklers, heating equipment, pipes, etc. where extra high lift is involved. Trucks 83 inches high are standard for industry. In fact, some go as high as 90 inches. So it's smart to plan beams and pipes high enough above the floor to permit standard trucks to operate safely. If extra high stacking is planned, consult the truck manufacturer to insure adequate clearance in the plant.

Place lighting fixtures in the most advantageous positions consistent with other equipment. Install bus ducts and main pipes above the bottom chord of trusses to keep the area clear.

Don't cut off overhead space with misplaced piping, conduit, air ducts, downspouts, line shafts, belting, knee braces, column caps, door lintels, fire doors, low beams, arches, and machinery.

Consider cube size of unit loads and containers to permit stacking of multiples with maximum use of vertical space.

If you plan balconies, plan their height to fit materials-handling equipment. Keep them low enough for lift trucks to reach them. If you plan crane service, be sure crane and load will clear.

This company didn't count its feet. A specialties manufacturer in the Midwest recently completed a warehouse for short-term storage of a carton-packaged product. Cartons were to be loaded on pallets. And pallets were to be stacked one on top of another. Height of loaded pallet was 4 feet. That meant that three-tiered pallet loads, 12 feet high, would fit easily under the warehouse's 14½-ft. ceiling.

But fire regulations require a 3-ft. clearance between ceiling and stacked goods. That meant the manufacturer could stack pallet loads only two loads high. The space between the 8-ft. level and the 11½-ft. level is completely wasted.

This shouldn't happen to anybody. A Cleveland plant had been operating trucks for some time. Then management decided to install some gas-fired unit heaters. The job had hardly been finished before a passing truck knocked a heater loose from its connections. Chagrined plant personnel looked around, found all heaters hung so low there was constant danger of damage from truck uprights. *Solution* (awkward, to be sure, but about the best that could be done under the circumstances): Build a steel guard around the heaters to shield them, paint them with bright colors, paint large spots on the floor beneath them, and place signs to warn truck operators.

Check Doorway Height and Width

Oftentimes a new facility is added or built with little or no thought to the height of standard uprights on fork-lift trucks. It is then necessary to order at additional cost free-lift uprights, or specially adapted machines. Often, too, even though the inside warehouse may have been planned with sufficient stacking space, doorways are planned too low, first, and too narrow, second. All manufacturers of materials handling equipment or their dealers will gladly provide specification information prior to construction and planning which should materially assist. Everything depends upon the unit load to be transported.

Automatic or power-operated doors are very important to the smooth operation of mobile materials handling equipment. There are several excellent ones on the market—button- or cord-actuated, electric-eye or even radio controlled.

Sometimes new plants are designed with extra-high ceilings to permit high tiering. This calls for a truck with extra high lift. In order to get it, the over-all height of the truck with the uprights lowered must be increased beyond standard. Everything is just dandy until someone tries to drive the truck through a doorway that is too low for the extra-high uprights. The problem is not too tough if the truck has to go through the doorway only once or twice a year, because it can be tipped forward. But if loads must be moved through this doorway on a continuous basis, it is obviously an impossible situation.

With reference to the minimum width and height dimension required to provide free flowing traffic when using a 4000-lb. fork truck with 24-in. load center, the industrial truck industry has more or less standardized on an over-all height of 83 inches so that the truck will pass through an 84-in. door. Using this 83-in. height and a 2-to-1 lifting-ratio upright, lift heights vary from 112 to 124 inches. A "free-lift" upright provides 130 inches maximum fork height with 83 inches over-all height. Minimum truck width depends on the load rather than on the machine.

One more thought about doorways: Provide doors of proper height and width to permit future extension of monorail to adjacent buildings, receiving docks, railroad sidings, and so on.

What if this had been you? In one plant where stacking of loads 160 inches high was found advisable, a truck with an over-all height of 98 inches was purchased. It turned out that doorways were 7 feet high, so it was impossible to get the truck through them.

Turn the page

Anticipating handling needs will save you money—and lots of cussin'!

As it happened, the truck was not going to leave the building once it was brought in. So by removing the uprights, it was possible to get it inside and re-assemble for use in the warehouse.

Not nearly so simple! In another plant where doorways weren't high enough, the solution was more difficult. Here it was necessary for the truck to pass through the low doorways frequently. Considerable expense was necessary to raise the height of the doorways to permit the truck to travel through them. It also meant major alterations in the building structure and purchase of new overhead doors.

Check Service Areas

A manufacturing plant is usually provided with preplanned space in new buildings for maintenance and other services. Frequently, however, planning ends right there. Methods and equipment for handling shop work, as well as layout details, are left to be worked out as the building goes into operation.

This planning short-cut can cause inconveniences, delays, and extra costs in the maintenance and service departments, of course. But, even more important, inadequate facilities may hurt production.

For example, the machine shop might not have enough crane or hoist capacity to handle the largest jobs it's supposed to do. Or not enough space to let a fork or crane truck handle the job in the shop.

Your building designer can save you trouble if you give him the same kind of information for maintenance and service operations that you furnish for production. Plan your handling for the service shops, and provide for the type and size of handling equipment needed.

If electric industrial trucks are included in your materials handling plans, you will need to include battery service in your service plans. Besides electricity, there are a few special requirements for a good shop to maintain and charge industrial batteries. For instance, these four:

Ventilation. Since volatile gases are generated during charging and discharging of batteries, good ventilation is a *must.*

Drainage. The floor should be sloped to a common drain of adequate capacity.

Acid proofing. Batteries contain strong acids, so the floor and drains of the battery room should be of noncorrosive materials.

Stream pollution. If battery acids are drained to a common sewer, there is the possibility of stream pollution. If necessary, a neutralizing arrangement or special drainage system will have to be provided.

Water supply. Batteries should be kept clean. Cases must be carefully washed. A good supply of pure cold water should be supplied on an overhead fixture that can be positioned to supply the entire battery-charging area.

Could have saved all that cussin'. There's a relatively new plant with maintenance shops in its basement. They service machines and equipment on the ground floor of the building. An elevator was provided for movement between shop floor and basement.

The plant wasn't in operation long before it found that heavy machines and parts had to be moved frequently from shop to maintenance—and back again. Loads that were beyond the capacity of the elevator.

When the big loads come along, the maintenance department has two alternatives: It can do the work on the shop floor—but that gets in the way of production, and makes the maintenance job slower and more costly. Or it can move the machine (or large machine part) to the shipping dock, load it onto a truck, take it around to the basement entrance, unload and move it to the maintenance shop.

A little larger elevator would have saved time and dollars, not to mention a lot of cussin'.

Check Elevator Size and Capacity

A large company in the Midwest ordered a fork truck, then found elevator capacity forbade use of the truck. *Result:* The truck had to be shipped some 500 miles to another plant owned by the same company, where it could be used.

Still another horrible example is the plant that ordered a 3800-lb. fork truck with a collapsed height

of 83 inches. After the truck was on the premises, the company found the elevator capacity was only 3000 pounds; elevator doorway, only 79 inches high. Because most of the fork-truck work was to be done on the third floor, the truck was utterly useless.

Elevators, like floors, must be able to handle the combined weight of truck and load. In fact, provision for even heavier loads in the future should be made.

Elevator-door width and height should be related to truck width and the combined height of truck and load. Truck width can vary, for example, from 30 inches (for an operator-led truck) to 60½ inches (for an 18,000-lb. riding-type fork truck). And height can vary from 50 inches (the first truck mentioned above) to 83 or more inches (the 18,000-pounder, for instance). But units as big as the latter probably would not work from floor to floor.

Elevator equipment should provide for precise leveling. This is very important because the smallest vertical difference between floor level and car level may be enough to dislodge a load as the truck moves in or out of the elevator.

The sad case of the too-small elevators. There are hundreds of reports of companies that have specified minimum dimensions and capacities for elevators. *Result:* Inter-floor handling of larger unit loads (a big trend today) becomes so costly—even if it is possible—that it offsets other economies of the larger truck required. Also it's hard for these plants to take advantage of other modern trends, such as relocation of machines to make new layouts for changes in product mix, larger trucks to handle heavier unit loads, and faster and bigger materials movement to get higher production per square foot of floor.

Check Receiving and Shipping Areas

The important element here is close correspondence between rail and truck dock heights and the floor heights of boxcars and highway trailers. Because relative height changes as truck or boxcar is unloaded, dockboards are used as bridges. But planning simplifies the matching of dock to floor height.

Height of boxcar floors ranges from 41 to 47 inches. Highway trailer floors usually are 48 inches high.

To meet these conditions, average height of railroad-siding docks is 44 inches. Trailer-truck docks range from 44 to 52 inches high.

Adjustable loading ramps are a *must* because of the varying heights of truck and trailer beds. Inside truck wells should not be lower than the street outside because water will flow in and impede mobile equipment in freezing weather.

If a spur railroad is part of the warehousing plans, better make allowance for varying sizes of boxcar doors. And better provide adjustable ramps so that lift trucks can move freely in spite of the different height of boxcar beds. Check with railroads.

Most serious dock problem seems to be that the receiving area is too small. *Result:* Overcrowding on the dock, plus lack of suitable space for unloading boxcars and highway trailers.

Avoid this common mistake. Company engineers carefully figured the turning dimensions for an *empty* fork truck, basing their calculations on drawings provided by the truck manufacturer. But unfortunately they forgot to take into account the fact that a wide load increases width; a long load increases length. So they went ahead and designed a loading dock so narrow a *loaded* truck couldn't swing into a boxcar.

Check Ramps and Inclines

Hold them to a minimum, because they can impair the over-all efficiency of industrial truck operation. They require more power. For gas-powered units this means greater engine wear; for electric trucks, higher current consumption.

Maximum grade may vary considerably. Depends on truck, loads, and frequency with which trucks must use the ramps. Generally an 8% grade is high enough for a truck, whereas a 5% grade is all you should expect a tractor (with trailer train) to negotiate. And the lower the grade, the better.

In some plants, efforts to save money have resulted in ramps that are too short and too steep. This situation either prohibits truck traffic or—where trucks are used—requires a bigger battery to compensate for the greater drain in voltage.

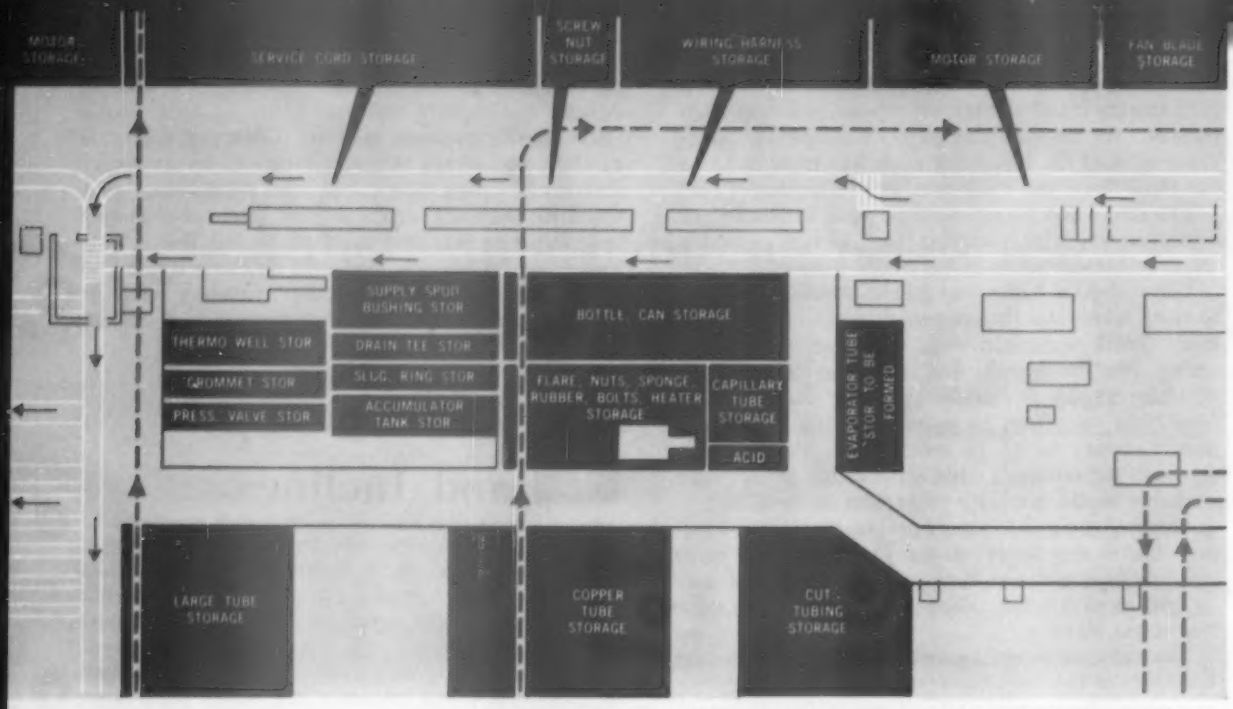
In building a ramp, first be sure the crown at the top is rounded sufficiently to permit the truck's frame members to clear as it crosses the crown. Second, keep the per cent of grade as low as possible; often a grade is just too steep for a loaded truck to travel without pusher help from another truck. Third, build adequate clearance at the bottom of the grade.

Often a truck needs a running start at the bottom of the ramp. When there is a turn just before the start of the climb, the truck has to slow down almost to a standstill to make a turn. *Result:* Not enough momentum to negotiate the ramp.

This boner was easy to fix. One company had a long, fairly steep ramp to negotiate, but accepted the situation because the truck had to climb the ramp only once each shift—and empty at that.

Engineers from the truck manufacturer figured the truck would make that one climb without trouble, and the truck was delivered. But at the end of a hard day's operation it failed to climb the ramp. Why? Because the charging station was at the top of the ramp, and the only time the truck had to climb the ramp was when the battery was run down.

The solution was to move the charging station down to the level where the truck usually worked. Fortunately this could be done. It was a simple answer to an unusual problem. But the problem should have been foreseen when the original survey was made. Which makes it typical of many other handicaps that stop you from making handling improvements you know would save your company plenty of money.



EASY-TO-REACH—That's the word for parts stored right at Ebco's assembly line. Layout shows how system works—and why no big stockroom is needed.

Now It's Point-of-Use Storage

Here's a sure cure for stockroom headaches. All you need is a simple system—like Ebco's. It's saving this company $28,000 a year in handling costs alone.

WHERE'S the stockroom? That question pops up when you visit Ebco Manufacturing Company's new Columbus (Ohio) plant.

Well, the only stockroom is so small you can't find it (see diagram). And Ebco can cite some solid savings chargeable to its new system.

Point-of-use storage is the key. Except for standard fasteners and a few small parts that are used in nearly all departments, purchased parts and materials pause only briefly in the receiving department—just long enough to be palletized and sampled by an inspector. Then they're stored in production departments, under direct control of production foremen. Same for components made in the plant. They, too, skip stockroom storage, go directly to point of use.

Why this system? To eliminate double handling—putting materials into stock, then pulling them out to fill requisitions. And to eliminate requisitions, too. Today, when a production operator needs parts or materials, he just helps himself from a stockpile that's almost at his elbow.

Sound chaotic? Needn't be—if you plan production ahead. Ebco does. A four-month schedule—updated monthly—calls the turn on purchase orders. That means all purchases are scheduled. And it doesn't take a big company to make the system work. Fact is, Ebco is small. Employs 265. Production is moderate and seasonal—electric water coolers (no more than 30,000 per year, for example), dehumidifiers, beverage dispensers.

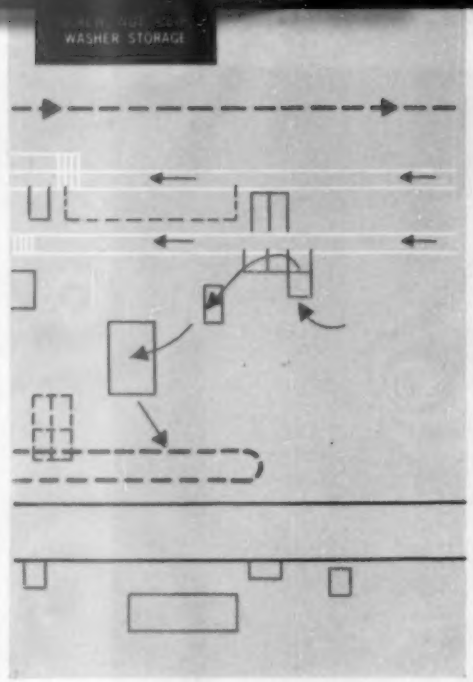
Payoff—The system is fairly new. Didn't really get rolling until the company settled into its new plant early in 1955. But already the combination of point-of-use storage and scheduled purchasing has produced these results:

. . . *Higher productivity.* Since January, man-hours per unit of production has dropped from 5.84 to 5.04. That's an improvement of about 14%. At least half of the improvement can be credited to the new inventory system.

. . . *Lower handling costs.* Receiving used to need eight handlers. Now it has two. Credit for eliminating four of them—and saving the company $28,000 per year in labor and overhead—goes to point-of-use storage. What's more, two fork trucks in receiving now do the job four trucks used to do. And the two idle trucks have been put to work in shipping.

. . . *Tighter inventory control.* Inventory of parts and materials has been reduced about 20%. Yet there's almost no downtime chargeable to shortages. And even though direct control of stock has been shifted from a central stockroom to production foremen, less vendor's scrap and fewer spoiled parts find their way into production.

. . . *Less paperwork.* Written requisitions are now obsolete. This sits



especially well with production foremen, who formerly had to write a requisition whenever they wanted something from the stockroom.

How it works—Some 900 different parts and materials move through receiving on their way to production. Receiving is manned by the folllowing people:

. . . *Two handlers,* who count shipments, load pallets, deliver stock to production by fork truck.

. . . *One clerk,* who helps count shipments and makes up receiving reports, which are sent to the materials-control center.

. . . *A foreman,* who spends about one-third of his time in receiving, the remainder as supervisor of the small-parts department.

. . . *An inspector,* who sample-checks shipments—a job that takes about 25% of his time.

Parts and materials are palletized as they arrive—by highway truck or railroad. Often they're simply left in their shipping containers. Sometimes different materials, destined for the same department, are put on the same pallet.

The receiving department's copy of the purchase order tells handlers where to make deliveries. No part or material starts its trip through production in more than one department. Exceptions to this: standard fasteners and a few other small parts that are used in almost all production departments. These items are kept on receiving department shelves and are requisitioned by phone when needed.

Deliveries to production are fast—usually within half-a-day after arrival of material at the plant. They could be faster, in fact. But pallet loads are allowed to accumulate before inspection in order to save the inspector repeated trips to the receiving department.

Handlers don't just drop their loads in production areas. If pallets are being stacked—they often are—handlers put the latest arrival at the bottom of the pile. This system keeps inventory on a first-in, first-out basis.

Department foremen don't check material in or out. But they are responsible for keeping track of vendor's scrap and parts spoiled in process. And they must satisfy the materials-control center when they don't have enough materials to meet production schedules.

Ebco-made components also bypass central storage, move directly to the departments that use them. Sometimes they go by fork truck; the production foreman hails a passing truck or phones the tiny stockroom for one. Sometimes they go by conveyor. (Overhead conveyors serve as storage banks between some departments.) And sometimes they're simply man-handled across an aisle in tote pans.

Operators cooperate, too. For one thing, pilferage is no cinch because the plant is windowless. For another, workers have been educated not to hide spoiled parts back in the stockpile.

How do foremen know what they need? The four-month production schedule is the tip-off. It's prepared by the manufacturing superintendent and the sales department. It goes to materials control—and to all production foremen. The first month is firm; second, firm but subject to change; third, tentative; fourth, very tentative. The schedule shows type of product (bottle-compartment water cooler, for instance), quantity to be made, model, production lot number, and condensing unit used with it.

A look at the production schedule tells a foreman what the plant will make during the month—and in what order. Then he refers to a permanent bill of materials. The bill shows how many units of each part go into a product—and the product routing.

Cutting foremen in on the overall production schedule gives them the big picture of plant activities. That way, they can cooperate better with each other, make their own operations more flexible.

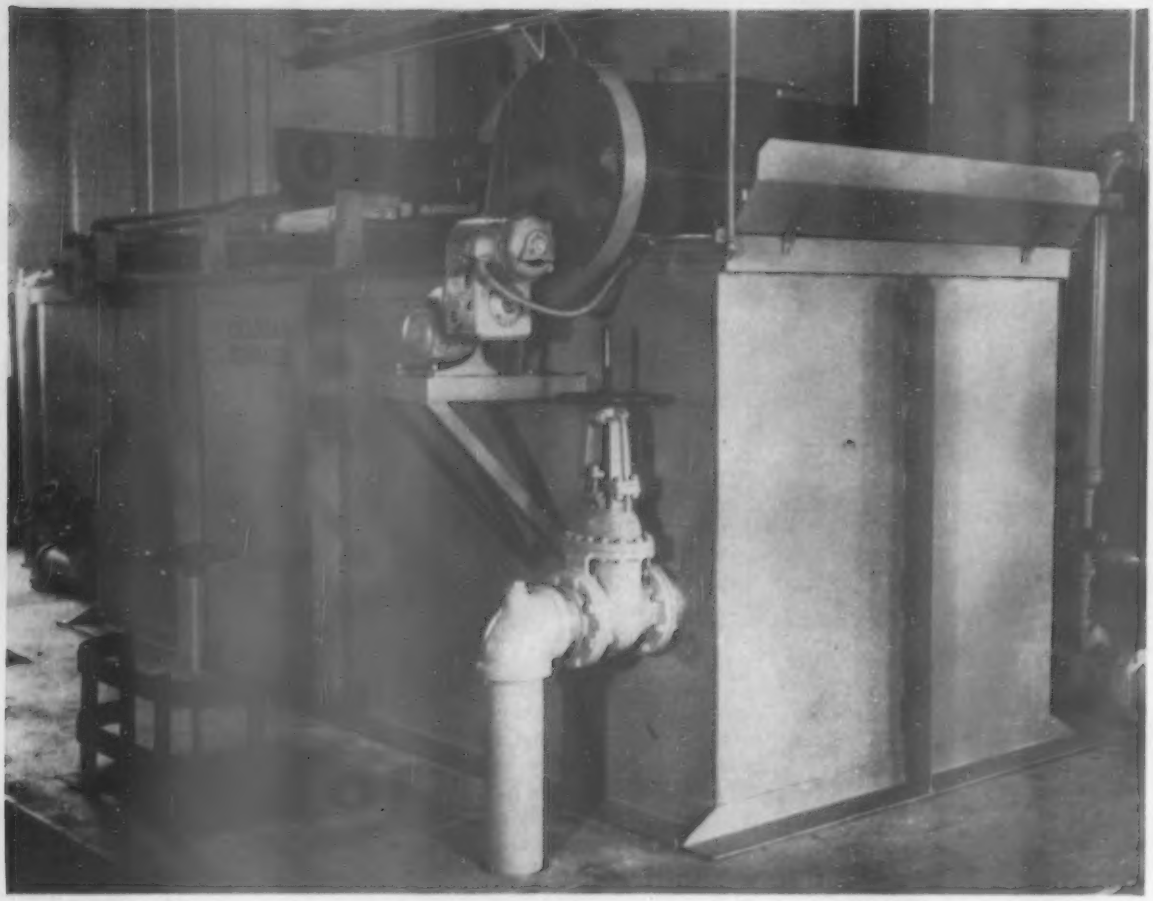
With plenty of stock at their fingertips, foremen don't work too far ahead of schedule. *Two reasons:* They have no place to put the stuff, and they aren't given enough extra manpower to do so.

Production governs purchases—Production foremen have to keep up their stocks of parts and materials. But primary responsibility for this is in the materials-control center. Materials control is the job of a supervisor, a full-time clerk, and a part-time clerk.

It's simplified by visual control tools—peg boards (Produc-trol) and visible-index wall files. Pegs show how long stock will last against current production schedules through the fourth month ahead. Cards give more details—amounts ordered, used, received, etc. Pegs and cards are updated constantly, weighed against a master bill of materials for the four future months. Pegs are adjusted and entries are made on cards when material is ordered, when material is received, when material goes to production, when scrap or spoilage is reported, and when foremen report shortages.

How much inventory? Ebco tries to keep at least a two-week cushion on hand. But there are plenty of variations and some extremes. A few critical items used in small quantities (some steel, for example) are ordered more than four months in advance. And Ebco keeps a six-month inventory of some small parts (such as washers) that are cheaper to buy in large quantities.

Deliveries on schedule—It's a tough problem for a small company that uses relatively small quantities of parts and materials. Ebco's solution: *standardization.* For instance, the company used to buy six different fan motors. Now it buys only two. It used to need seven different compressors in two lines of water coolers. Now it uses only four. But the big answer to the supply problem is the supplier. Ebco's suppliers all know how the company operates, jump through the hoop to help in any emergency.



SEPARATOR UNIT doesn't take up much room, can handle 180,000 gallons of effluent per day. Oil particles are brought to top of water by air bubbles dissolved into waste. Flight scrapers, driven by chain drive at top, skim off floc.

Cleaning Up Oily Waste Water

Soluble oil from cutting and grinding operations will no longer contaminate community waters at Fort Wayne. Not since Harvester installed its new separator.

WE HAD A PROBLEM at International Harvester's Fort Wayne Works. For a number of years our plant had been discharging oily waste water through a 90-in. storm sewer. This sewer emptied into the headwaters of an open ditch. The ditch flowed on through a city park, then through a residential district, finally into the Maumee River.

By JACK E. SHIDELER, JR.
Plant Engineer
International Harvester Company
Fort Wayne, Ind.

Management realized that I-H had a civic responsibility to clean these waters up. So we got busy.

We found the oil in the waste water came from three sources:

. . . *Cylinder lubricating oil* used in our forge shop.

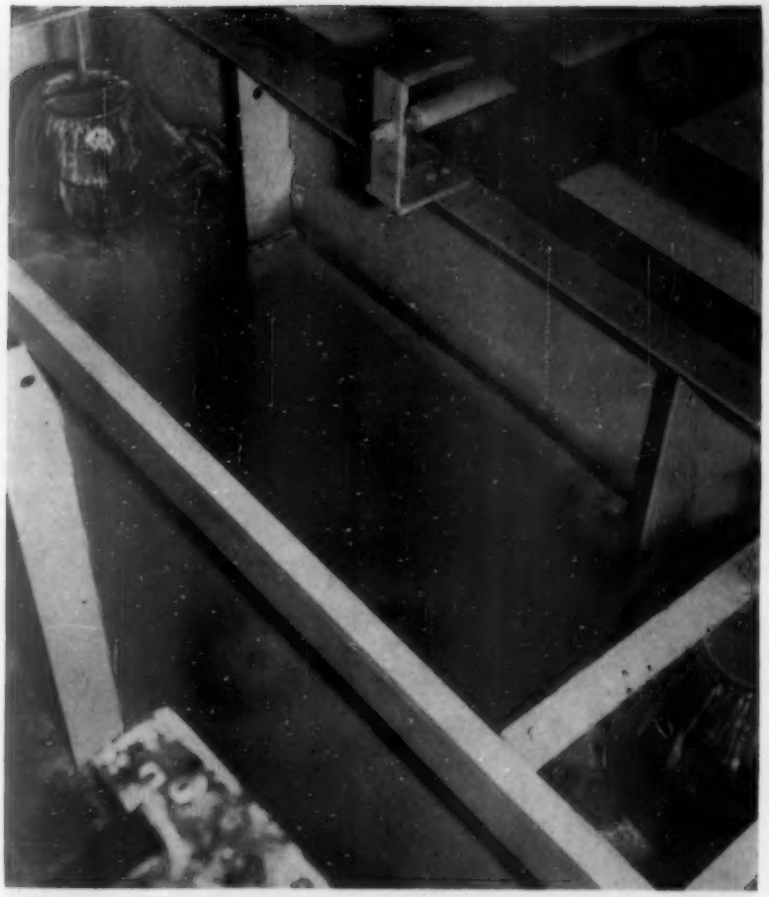
. . . *Cutting oils* drained into the sewer from steel turnings being loaded in gondolas for shipment to the mills.

. . . *Soluble oil* used in cutting and grinding operations.

The first two oils offered no problem in elimination. They are easily separable from our waste water by gravity.

But not the soluble oil. It had to be demulsified—i.e., precipitated out of solution. So we investigated the cost of various methods. One that seemed simple turned out to be an expensive installation with a high operating cost. None seemed to meet our needs.

Then we heard about the Colloidair process (made by Bulkley, Dunton Processes, Inc., New York). The results claimed for it seemed almost too glowing. So we visited



CLOSE-UP VIEW over top of this open tank shows oily floc on surface of water. Flotation chamber is in background. The treated water drains into the storm sewers.

a comparable installation in Detroit. And we found that the unit there was doing exactly the job we wanted to do, and doing it well.

Solution—On the basis of the Detroit demonstration we purchased and installed a Colloidair unit. (Although we figured our waste water flow at 75 gpm., we bought a 125-gpm. unit to care for expansion.) It does the trick. A laboratory report shows how well it works:

	Raw Waste	Treated Waste
Oil content, ppm.	500 to 1000	Less than 10
pH value	7.2	7.0
B.O.D. (biochemical oxygen demand), ppm.	149	21.3
Dissolved oxygen, ppm.	0	4.2

How it works—Air is used as the main means of separation. It is introduced into the flow of waste water and dissolved in a pressure tank under pressure, say 25 psi. When the pressure is released by flow of waste into another tank, air bubbles rise to the surface, carry the minute particles of oil up with them. This process of separation is helped by the addition of a chemical coagulant, which promotes flocculation. And also permits higher separation efficiencies.

Soluble-oil bearing effluents are collected in a 6-in. sewer, which discharges into a sump pit by gravity flow. From here they are pumped into a holding tank (40,000-gal. capacity) under the Colloidair tank. Two process pumps—located in a dry pit so as to have flooded suction — then pump the waste into a pressure tank. Here air inspirated at the process pumps through Pemberthy ejectors is "dissolved" into the waste under 20 psi. pressure.

The coagulating chemicals—aluminum sulphate and activated silica solutions—are added by a Hills-McCanna proportioning pump just ahead of the pressure tank. It is mainly in this tank that microscopic air bubbles attach themselves to microscopic particles of oil.

The solution now flows from pressure tank to open inlet chamber of the Colloidair unit. An air-operated valve maintains the tank pressure. In the inlet chamber a floc containing the soluble oil begins to form and rise to the surface. A partition — sort of a weir — prevents turbulence as the solution passes on into a second chamber — the flotation chamber. Here the floc is continuously scraped off the surface by a flight conveyor. The floc is discharged through a recovery chamber into a sludge pit under the waste treatment plant.

Clarified water drains off continuously from bottom of flotation chamber through adjustable-height risers in an adjoining compartment, then into the outlet to the ditch. We provided mechanical filters in this outlet for a final clean-up. But to date they have not been needed. Time for water to flow from inlet to outlet is about 20 minutes.

No part of the system can discharge untreated water into the sewer. All drains are piped back to the holding tank. Thus the Colloidair unit can be cleaned at any time. Valving and piping are arranged so that in starting up the unit the treated water can be returned to the holding tank if not clear.

At first we operated the unit manually. But a float-and-switch in the holding tank make it automatic. We have also installed a skimming device to remove free oil that floats on the surface in the holding tank. The oil is removed at intervals, and flows to the sludge pit.

Operation of our unit requires about 20 man-hours each week to mix chemicals and check the unit. And about 40 man-hours to haul the sludge to a commercial dump.

Four Handling Cost-Cutters

No need to spend big money to get better handling. Four Wheel Drive built these four work-savers mostly from scrap. They'll pay for themselves over and over.

WANT PROOF that better materials handling pays off? Okay. Just look at what Four Wheel Drive (Clintonville, Wis.) has done in the way of savings. The four bright ideas on these two pages cost FWD about $9200. Before the end of the first year, they've paid for themselves in labor savings. And kicked in with a bonus benefit — more space, neater working areas.

FWD made most of this new equipment right in the plant—from steel angle, channel, and pipe that formerly was considered scrap. But scrap is the last word for it today.

How's the cost figured? Skates, casters, conveyors were all bought at going prices. Then, to be completely fair, FWD put current market prices on formerly useless materials that went into home-made equipment illustrated. Even at that, it still shows a profit.

Truck-Cab Assembly

New Method—Skate-wheel conveyor (80 feet long, 48 inches wide) and turntable pallet fixtures make truck-cab assembly easy. Cabs are brought from outdoor storage, placed on turntable pallets at end of conveyor (capacity, 13 cabs), Pallet runners rest on skate wheels bolted to the conveyor structure. Pallets keep cabs from bumping each other. As cab is pushed along, operators fasten parts and accessories on. Turntable lets operator rotate cab, work on any side of it. Crane lifts completed cabs to castered metal dollies, which carry them away to storage or assembly.

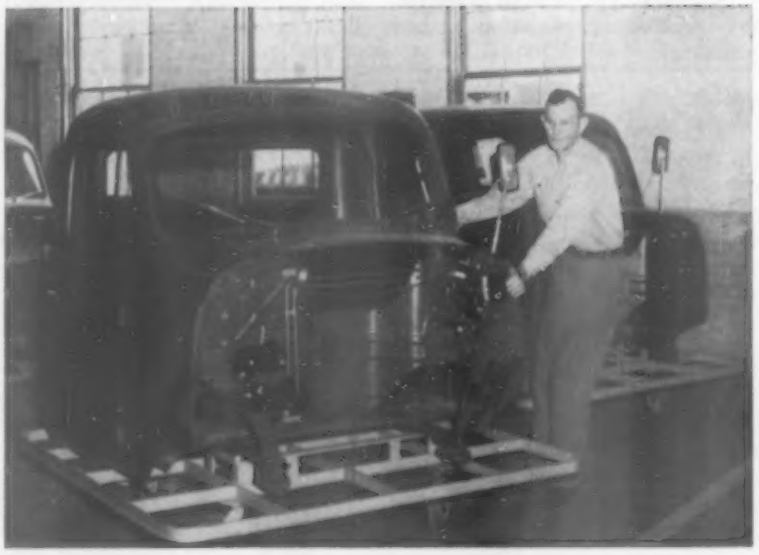
Cost? — Skate - wheel conveyor, $500. Turntable pallets, about $300 for 15 units.

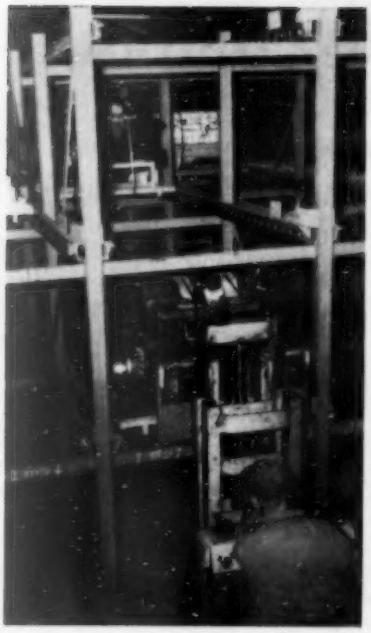
Benefits—Savings with the new method of cab assembly total well over $3000 per year. What's more, the assembly area is far more orderly now than it ever was when men worked with the old method.

Old method—Cabs were mounted on wooden dollies with casters.

Dollies on Casters

Dollies like these (right) are used for temporary storage of completed truck cabs and for moving cabs some 20 feet to assembly line. One man can move a cab on a dolly with ease. Two of the four rubber-tired casters are swivel-type for easy maneuvering. Dolly body is 2-in. channel iron. *Cost:* $60 per dolly ($600 for 10), including casters.





Conveyorized Storage

New method—This 30-ft.-long rack (left) holds 300 truck engines. It's divided into 14 open-sided compartments, accommodates 14 different engine models (only 10 models are now used). The rack is built in a covered alley area between two buildings, runs wall to wall.

Each compartment is 60 inches wide, 36 inches high, runs the full 30-ft. length of the rack. The 14 compartments — three rows with four plus two on top—are equipped with gravity skate-wheel conveyors. The 4-in.-diam. skates are bolted to horizontal members of the rack.

Here's how the set-up works: A fork lift truck feeds engines on specially designed metal pallets into proper compartments at the rear of the rack. The unit then rolls along the slightly inclined conveyor (1½ inch to 10 feet) toward the front of the rack. It stops when the pallet strikes the pallet of the engine in front of it.

When an engine is needed for assembly, proper model is lifted from front of rack by fork truck and transported to engine assembly area some 20 feet away. Here other components are added to the engine to make it ready for use.

If an engine doesn't roll out to the front of the rack when needed, it can be pulled easily with an iron hook. Metal upright stoppers at ends of conveyor runs prevent engines from falling off rack.

The specially designed metal pallets are supplied to the engine manufacturer by FWD. They remain strapped to engines until engines are ready for installation in truck.

Cost?—All-welded rack, built of ¼ x 2½-in. angle and 6-in. channel iron, cost about $1500. Pallets —made of ½ x 1¾-in. angle— cost $17 each, or $5100 for the 300.

Benefits—Labor savings alone total more than $3500 per year. This includes reduced handling and the elimination of cleaning. And plenty used to be needed when the engines were stored outdoors. Now no more clean-up of weather effects. No more rust to remove. Another thing: Automatic first-in, first-out storage reduces the chance of rust during the storage period.

Old method—Engines used to be stored out-of-doors in wooden delivery crates.

Revolving Platform

New method—The set-up shown in the photo above lets the operator stand still while he rotates a heavy engine to the correct position for attaching components, such as carburetor, distributor, generator, and starter. Secret of the installation is a turntable platform (with a roller conveyor section) that is 6 feet in diameter and stands 18 inches above the level of the floor. Removable pins at the ends of the turntable conveyor sections keep the engine from falling to the floor. *Added note:* In the photo, the engine being assembled is still supported by metal pallet it was delivered on.

Up to five additional engines—awaiting assembly—can be stored on the 10-ft. roller-conveyor approach to the turntable. Fork trucks supply this feeder conveyor from the engine storage rack. When completely assembled, engines are removed from the turntable by an overhead bridge crane and are transported to the truck assembly line.

Cost? — Well, the home-made turntable platform cost only $600. Standard roller conveyor equipment cost another $600.

Benefits—One man now does the same work that two men used to do. This adds up to a direct labor saving of approximately $3000 per year at present volume of production. In addition, the new arrangement has cut floor-space requirements for engine assembly by 40%.

Old method—Immovable wooden dollies that had to be transported by lift truck were used to support engines during assembly.

How to Plan Your Phone System

Chances are your in-plant system isn't nearly as effective as it could be. Here's how to analyze it, and how to help the telephone company help you up-grade it.

NINE SURE SIGNS that your plant's communication system is inadequate are these:

. . . *Incoming or outgoing* calls are difficult to make.

. . . *In-plant directory* is not up to date, resulting in frequent "wrong party" calls.

. . . *Transferring calls* from one telephone to another is difficult.

. . . *Frequent complaints* about ambient noise levels in certain locations.

. . . *Telephone liaison* between departments is poor.

. . . *Complaints about "too many people* on same phone" are frequent.

. . . *Telephones are cumbersomely* mounted, and not within easy reach of users.

. . . *Executives don't have* complete privacy on their lines.

. . . *Provisions for after-hour* or night incoming calls are poor.

Any one of these "signs" may be important in itself, but altogether these easily recognizable danger signals indicate a fundamental shortcoming of the system.

There's no need to point out here the reliance plant operating men place on their telephone system — it's an important, everyday working tool. Yet, in spite of this, how many plant men have taken the time to work out the best possible plant communications system? Few indeed. Although the telephone company is happy to assume the entire responsibility for the design and installation of your system, plant men should make every effort to furnish all data possible to its engineers. Otherwise they cannot know the detailed communications requirements of your business. If you help them set up the system for your plant, you'll be sure you're getting every advantage of all available telephone services. So whether you're building a new plant, or simply making a periodic survey of your communications needs, it will pay you to find out where you stand.

By J. B. SMITH, Division Sales Supervisor, Southern Bell Telephone & Telegraph Company, and S. E. FORT, Factory Planning Engineer, Western Electric Company, Inc., Winston-Salem, N. C.

IS SYSTEM ADEQUATE?

There's just one way to find out. That's to make a careful analysis of your requirements. The form reproduced on the facing page is used every few years for surveys of the telephone needs of each employee in many plants. And such a survey should be a part of the regular planning for every new plant. Where possible, survey results should be sample-checked by actual counts of calls made prior to the survey date.

Results of the surveys have never failed to indicate clearly an important point: You cannot assume that a plant communications system that was perfectly adequate a few years ago is adequate today.

Once the survey has been made, you should try to summarize the requirements for various types of phone service. Since such requirements vary widely in different plants, it's impossible to outline here any suggested form for a summary. However, the aim should be to reduce the survey answers to convenient form for group study. Survey completed, you at least know what your plant's requirements are.

Then call in telephone engineers — With just two basic tools in hand — the survey summary and building and departmental layouts — telephone company engineers can be of maximum help to you. Knowing what you need, they can put their knowledge of available equipment and services to the most effective use.

PLAN SYSTEM LAYOUT

In planning Western Electric's Winston-Salem plant system, a survey was made of the people that would be located at the new plant. With survey and preliminary layout ready, company engineers began their conferences with Southern Bell Telephone engineers. These were scheduled weekly until the system could be firmed up. And, since the plant telephone system is an important item in company expenditures, regular meetings were continued—to iron out any kinks—even after the equipment had been put into operation.

At an early stage of the planning, the telephone engineers were able to determine the basic facilities the plant would require, and place orders with its supply houses well in advance of actual needs.

The main switchboard—The first evidence of necessity for close cooperation between company engineers and telephone specialists on a new system layout comes early in the planning of the central switchboard. Since all telephone lines lead to it, many of the physical requirements of the network will be dependent upon the size and location of the central switching system.

In finalizing building plans, you should consider not only the location of the main switching center, but also the problem of bringing in the trunk lines from telephone-company outside facilities. If cables are to be brought in underground, right-of-way must be secured, and conduit or underground duct provided. Manholes must be placed at frequent intervals to serve as cable-pulling boxes, junction points, and maintenance-access spots. If overhead runs are used, poles must be provided at specified distances.

The switchboard area and equipment rooms should be centrally located — in relation to the general plant layout as well as to the telephone system — to economize on cable and conduit runs. It should be easily accessible for building services and personnel. A relatively quiet area is best, and the surrounding operations should be as free as possible from dust, grease, or grime to

How To Analyze Your Communication Needs

QUESTIONNAIRE

Name.....Title.....Dept.....

Plant Location..... Working Hours:.....A.M. to.....P.M.

1. Whom do you call?

a) Interplant .....%

b) Local outside calls.....%

c) Long-distance calls.....%

Are LD calls limited to certain cities, plants?

Yes.....No.....

If so, what cities or plants?

....%

....%

....%

Give approximate frequency of LD calls:

.....times daily to.....

.....times weekly to.....

.....times monthly to.....

2. Who calls you?

a) Interplant .....%

b) Local outside calls.....%

c) Long-distance calls.....%

Do LD calls come from certain cities, or plants?

Yes.....No.....

If yes, what cities or plants?

....%

....%

....%

Give approximate frequency of LD calls:

.....times daily from.....

.....times weekly from.....

.....times monthly from.....

3. Do you have conference calls? If so, how often?

.....daily.....weekly.....monthly

4. About how many calls per day do you average?

.....receive?.....

5. Does your secretary or others answer your telephone?

Yes.....No.....

6. Do others complain about having difficulty reaching you because your telephone is busy?

Yes.....No.....

7. During your calls do you often phone subordinates or others for information?

Yes.....No.....

8. Do you have difficulty hearing on a telephone?

Yes.....No.....

9. Do you need hands free to write during calls?

Yes.....No.....

10. Do you use a telephone in an area where light is limited, such as a dark room, etc.?

Yes.....No.....

11. Is a wall or hang-up set more practical than a desk set in your work area?

Yes.....No.....

12. Do you need a portable plug-in telephone in certain areas, such as test areas?

Yes.....No.....

13. Is your work area noisy?

Yes.....No.....

14. Do you need signal lights or bells on your telephone?

Yes.....No.....

15. Have you analyzed the information you send or receive to see if it can be handled by automatic telemetering equipment?

Yes.....No.....

16. If you can code information you send or receive, what is the nature of this information? Where does it come from? Where does it go?

.....

.....

.....

.....

17. Do you need a telephone in a potentially hazardous location, where fumes may accumulate, etc.?

Yes.....No.....

18. Do you often send telegrams to certain cities or plants?

Yes.....No.....

If yes, indicate frequency:

.....times daily to.....

.....times weekly to.....

.....times monthly to.....

19. Do you often send air mail or special delivery letters to certain cities or plants?

Yes.....No.....

If yes, indicate frequency:

.....times daily to.....

.....times weekly to.....

.....times monthly to.....

20. Do you need a credit card for travel calls?

Yes.....No.....

21. If you make calls when you travel, do you often call certain cities, plants, or persons?

Yes.....No.....

If yes, indicate city, plant, and person:

....

....

....

22. Do you often have non-company visitors?

Yes.....No.....

23. During your telephone conversations do you often find it necessary to move about to consult ledgers, books, blueprints, etc.?

Yes.....No.....

24. Do your duties require you to leave your work area often?

Yes.....No.....

25. Do you have a significant increase in telephone calls during certain weeks or months?

Yes.....No.....

If yes, explain the reason:.....

.....

.....

26. Do you supervise a materials handling or servicing group?

Yes.....No.....

If yes, show area covered:

.....sq. miles,.....sq. feet

Type of vehicles used.....

No. of vehicles used.....

Method of dispatching.....

27. Does your position require you to keep in constant touch with news occurrences?

Yes.....No.....

28. Does your position require you to keep in constant touch with stock market transactions?

Yes.....No.....

TO FIND OUT WHERE THEY STAND, Western Electric engineers use this questionnaire form to determine the communication needs of each person in the plant. Summarized, it supplies an excellent working tool for planning a new system.

Quick Guide to Plant Telephone Equipment

(A selection of basic communication "items" from a list of over 400 available)

TELEPHONES

HAND SETS

Single (black or other colors)
USE: For the general use of an individual. Colored sets for reception areas, salesrooms, or executive offices.

Extension (black or other colors)
USE: To save steps and time for an individual where his work area is large. For two or more individuals who work on the same problems.

1, 4, or 6-button types (key sets)
USE: As satellite switching centers for small groups of workers. They make possible combinations of inside and outside lines.

Speakerphone
USE: For small group conferences or for free use of the hands.

Illuminated dial
USE: For use in darkrooms or area where light is limited.

Plug-in, portable
USE: For large test areas where considerable movement is required. For emergency or temporary services that are constantly changing in a large area.

Volume-control
USE: For hard of hearing. Especially good for areas that are intermittently noisy or where noise of any kind occurs.

Explosion-proof
USE: For hazardous areas.

Outdoor
USE: For shipping platforms, parking lots, guard houses, etc.

Hang-up
USE: Has mounting flexibility and minimum space requirements.

WALL SETS

USE: For areas where desks or tables are not used. Good for production and transportation areas, in-plant or outdoors.

In-plant coin stations
USE: For employees who do not have telephones and for those who want privacy. They may be for outsiders also.

Outdoor coin stations
USE: For employees and others who are stranded outside the plant.

ACCESSORIES

Shoulder rests
USE: To free the hands for writing.

Cut-off switch, manual or automatic
USE: To cut off extensions on same line for privacy.

Spring cords
USE: To minimize entanglements.

SPECIAL SERVICES

Automatic answering and recording
USE: For after hours or shutdowns

Answering only
USE: Mainly for information purposes

Mobile radio telephone
USE: For service, maintenance or material handling departments. Voice or signaling systems.

Special telemetering lines
USE: For remote or widely scattered points, where information can be coded and controlled.

TWX exchange service
USE: To transmit messages where long distance calls, telegrams and air mail letters to certain plants or offices are frequent. Also gives you a direct line to other customers with TWX service facilities.

Annunciator or public address
USE: In large plants or departments for paging or special announcements.

Private line
USE: As direct lines to other plants or locations.

Foreign exchange
USE: As direct lines to other cities, where you can call any number in that city, or where you can receive local calls.

Emergency and burglar alarm
USE: To protect a plant at all times from fire, flood, theft, etc.

Long-distance
USE: Over 400 different types serve special needs and afford savings.

Toll credit cards
USE: For convenience when traveling, with charges billed to company.

Teletypewriter
USE: For stock market or news association ticker services. Also on private lines for multi-copy forms, orders, etc.

Code calling
USE: Prearranged code signals to advise individuals away from their locations to call PBX or to dial a prearranged code.

Closed-circuit television
USE: For remote monitoring and for inter-plant meetings.

YOU CAN GET MORE from the telephone company than "a telephone." There are many types of phones available, and many special types of systems that few plant men think of. A few of over 400 are listed above.

YOUR PHONE SYSTEM

Begins on page 96

protect the delicate switching equipment and relays.

From the information already turned over to the telephone company at this stage, the space requirements for the switchboard and associated equipment can be determined. Using a completed outline drawing, telephone company engineers will spot the switchboard, cable racks, switching equipment, standard and emergency power supplies, and other pertinent equipment on the drawing. With your plant engineer they will develop the best lighting arrangements for each room. Since the switchboard room is a center of activity during any plant emergency, provision is normally made for auxiliary or standby power.

For use in soldering the thousands of connections associated with telephone equipment, many 110-volt receptacles should be installed.

The telephone company should be advised about details of the plant's power characteristics—voltages, phases, and frequency—so it can choose the correct rectifiers to supply the d-c requirements of the telephone equipment. It's up to the plant engineer to connect the plant

power supply to the primary of the rectifier.

In the case of the new Western Electric plant, a ten-position automatic dialing switchboard was selected to form the nucleus of the system. Switchboard room and equipment require an area of 2795 square feet. The area is isolated from the rest of the plant with concrete-block partitions and sealed overhead with acoustic tile — providing an essentially dust- and sound-proof room. Also airconditioned.

The distribution system — The next job is distributing cables from the switchboard to the individual telephones throughout the plant.

The primary-distribution cables fan out from the equipment room to a number of large terminal boxes, from which secondary-distribution cables fan out to smaller terminal blocks; and finally, from these, twisted pairs of conductors — the tertiary distribution — lead to the instruments themselves.

The primary distribution should be attacked first. Before the conduit can be run, however, it's necessary to distribute the primary terminal boxes. They should be placed to provide a flexible system — that is, located so there is primary service reasonably close to all heavy-usage areas. And they should be sufficiently oversize to accommodate any reasonable changes in demand in the area they serve.

At the Western Electric plant, company engineers made a careful study of the areas in the plant liable to require heavier distribution than others. Working from this study, company engineers were able to locate the boxes so they were centrally placed in relation to the load —at the same time secondary distribution lines were minimized. The boxes were recessed within permanent walls, and mounted at a convenient height for servicing. They were located so any necessary servicing would not interfere with production workers — and were well away from any high-voltage lines.

Same general procedure was followed in the layout of the secondary distribution, except that cable runs to secondary boxes were run in underfloor duct in any area where the layout was permanent.

The tertiary distribution layout requires careful attention to detail if it's to have a good appearance. The key equipment requires relay boxes and rectifiers — which are bulky. We placed relay boxes in maintenance rooms—out of the way. For private-office phones, we placed the outlets in walls.

RESULTS OF PLANNING

There's a great deal of satisfaction in studying the results of the careful planning that went into Western Electric's system. The plant switchboard has 2700 lines fanning out to all locations throughout the plant. 103 tie lines feed to other nearby company plants.

And since plant activities are world-wide, we provided four tie lines to our New York offices, one to our Chicago plants, and one foreign exchange line each to Washingington, Newark, New York, and Charlotte, N. C. There are two conference-call units that permit two simultaneous conference calls, each having up to five conferees.

These facilities give our plant staff quick access to the vast network of telephone lines throughout the world. And incoming calls are seldom delayed—there are 47 possible trials to secure a line before the "busy signal" sounds. "Toll-diverting" equipment permits management to control long-distance calls, since such calls can be made only through the plant operators.

Room for expansion — Switchboard positions were filled only to about 75% of capacity when the plant was built. While this allowance might sound liberal, it didn't prove so in fact. After only six months of operation, the system is loaded to 90% of capacity. Since replacing the basic system would be costly for both Western Electric and the telephone company, provision for future expansion was imperative.

EFFECTIVE USE

Like any other industrial tool, the value of a communications system lies in its effective use. Over the years, the company has adopted certain procedures that have proved their worth:

. . . *Confined operators' duties* to the switchboard. Combining the jobs of operator with receptionist or typing duties seems to be unwise, even in small plants. The operator should have no distractions to prevent her from answering each incoming call quickly, giving it the full attention it deserves.

. . . *Taken full advantage* of operator-training bureaus maintained by phone companies in our areas.

. . . *Established good, up-to-date in-plant directory*. This is an important key in efficient use of the system. Individuals should be listed alphabetically as well as by organization and duties.

. . . *Supplemented the telephone system* with a means for locating employees who are frequently away from their telephones. An inter-com system is a good way to accomplish this. Key stations—the type of system in which an incoming call can be directed to any of two to six different phones in a department — will frequently ease this situation.

SPECIAL SERVICES

In the chart opposite you'll find a list of basic types of equipment available for use in, or with, your telephone system. A look at even this basic list will indicate there is virtually no regular or special service that cannot be supplied by your telephone company. For example, two-way radio systems are available as an integral part of the phone system. Another special service available to plant men is telemetering lines for automatic transmission of coded information. Uses include determination of power loads, measurement of gas, liquid flow, and the like. These lines may be used with supervisory control circuits that permit an operator at a remote point to control generators and feed regulators, operate circuit breakers, and so on. At Winston-Salem, the use of telemetering circuits has begun on a small scale for metering purposes and transmission of precise time measurements. It's expected that use of these circuits will expand as plant activity increases.

There are literally hundreds of special services and toll arrangements available through the telephone company to meet your special needs. A few have been listed here to indicate the kinds of problems in in-plant communications that can be solved with proper planning. If you study your needs, then review them carefully with the telephone company, your plant will have a good communications system.

How Middle Managers Really Think

Like foremen, this survey shows—not like top managers. So if you want to be a high-level manager, better think like one. The survey will show you how.

YOU MAY BE SHOCKED at the conclusions this survey will force you to draw. It shows that . . .

. . . *Middle managers think* more like foremen than like top management executives.

. . . *Training programs often give* the supervisor more knowledge of company policies and objectives than middle management can glean from the front office.

. . . *Examples set by superintendents* and factory managers are often the kind that discourage foremen from accepting front-office policy.

All this may hit you—a plant operating man—right where you live. With serious consequences, too. You may have been damaging your own effectiveness by failing to look at your job from a topside viewpoint. Or puncturing your promotion chances by reflecting the attitudes of your subordinates (such as giving only lip service to topside policy while still feeling like one of the hired hands). Or failing to identify your own actions with your company's over-all objectives.

By ROBERT M. CREAGHEAD
Senior Vice President
Group Attitudes Corporation, New York.

WHAT THE SURVEY SHOWS

Where does middle management stand? Does its thinking have the color of management or of supervision? The figures in the chart on the opposite page indicate the latter. Since most people admit there is a barrier in thinking between top management and foremen, where does that barrier fall? Between top and middle management, or between middle management and supervision? Over-all response to the survey indicates the barrier lies between top and middle management.

The figures in the chart therefore suggest why we have some problems in training supervision. And they indicate that our real training problem is that foremen today *do* think like management—but they think like middle management, not like top management.

Do these figures mean that top management has dropped the ball? Or do they mean that top management has failed to prepare plant operating executives for developing better supervision? Whose fault is it that middle management tends to think in specific terms and doesn't always understand broad organization-wide policies?

The survey response may explain why top management so often brings in an outsider for the new plant manager, rather than promotes the present middle-management man. It may also show that many people have been barking up the wrong tree in placing so much emphasis on the training of supervisors. And it may explain why so many supervisors come back to their trainers and say, "Why train us? Why not train our shop superintendent and our factory manager? They're the fellows who really need it."

Of course, we can't assume that even top management would score 100% on the 12 questions given in the chart. But top management would have to score far below 100% to get down to the level of middle management's thinking.

If middle management thought more like top management, it might be easier to get foremen to accept new ideas and new approaches. In the past, we have overemphasized the necessity for changing foremen's attitudes, trying to get them to understand policies and accept management ideas. Perhaps, instead, we should have put greater emphasis on trying to get middle management to understand top management's thinking and objectives.

Does this explain why middle-management men often give only lip service to training departments in their efforts to improve supervision? Does it also explain why some middle-management people feel threatened and challenged by efforts to improve supervision?

Questions 1, 2, and 3—Four out of five middle-management men and

About this survey—The figures on the opposite page reflect the views of over 1500 middle managers and foremen in 15 leading industrial organizations. The data were collected in depth interviews conducted by Group Attitudes Corporation, specialists in communications. The 15 organizations—all leaders in their field—include an appliance manufacturer, two glass specialty manufacturers, several metal-working companies, a textile company with plants in New England, two paper-goods fabricators.

Original purpose of the study: To find out why—and to what extent—foremen feel inadequate or uncertain in carrying out company policies. What surprised the analyst is that on most questions middle-management thinking was much closer to that of foremen than to that of the front office.

Conclusions are hard to draw, says the author. But the study suggests that the problem of effecting policy may lie with middle management rather than with foremen. In any event, these statistics suggest many provocative questions. They are questions that, if answered affirmatively, may reveal the troubles encountered in carrying out supervisory and executive development programs. These very difficulties may be standing in the way of your own advancement.

HOW MIDDLE MANAGEMENT FEELS ABOUT ITS STATUS

Here are the answers to 12 questions that were asked of 499 middle-management men (33% of total surveyed) and 1030 foremen (67% of total). On nearly every question, they think alike.

	QUESTION	RESPONSE				
1	Do you feel management welcomes your suggestions?		YES	NO	DON'T KNOW, NO ANSWER	
		MIDDLE MANAGERS	81%	19%	0%	
		SHOP FOREMEN	84	13	3	
2	Do you feel management usually acts on your suggestions?	MIDDLE MANAGERS	66%	33%	1%	
		SHOP FOREMEN	67	25	8	
3	Do you feel management gives proper recognition to your suggestions?	MIDDLE MANAGERS	67%	33%	0%	
		SHOP FOREMEN	64	34	2	
4	How complete a working knowledge of general information about the company would you say you possessed?		GOOD TO EXCELLENT	FAIR	POOR	DON'T KNOW, NO ANSWER
		MIDDLE MANAGERS	54%	28%	17%	1%
		SHOP FOREMEN	58	26	15	1
5	Do you feel you know the limits of your authority?		YES	NO		
		MIDDLE MANAGERS	69%	31%		
		SHOP FOREMEN	59	41		
6	Do you feel you know the limits of your responsibility?	MIDDLE MANAGERS	69%	31%		
		SHOP FOREMEN	60	40		
7	Do you feel you have enough authority to carry out your responsibilities?		YES	NO	DON'T KNOW, NO ANSWER	
		MIDDLE MANAGERS	73%	26%	1%	
		SHOP FOREMEN	70	29	1%	
8	Do you feel you are a part of management?		YES	NO	UNCERTAIN	
		MIDDLE MANAGERS	65%	6%	29%	
		SHOP FOREMEN	57	8	35	
9	Do you feel you are in management's confidence?		YES	NO, OR PARTLY		
		MIDDLE MANAGERS	62%	38%		
		SHOP FOREMEN	44	56		
10	As a general rule, do you feel management backs you up properly?		YES	NO	PART OF THE TIME	
		MIDDLE MANAGERS	66%	5%	29%	
		SHOP FOREMEN	66	5	29	
11	How adequate do you feel is your understanding of company policy?		ADEQUATE	LIMITED BUT CLEAR	NOT CLEAR	NOT ADEQUATE
		MIDDLE MANAGERS	26%	22%	44%	8%
		SHOP FOREMEN	23	35	29	13
12	How clear is your understanding of the company organization structure?		CLEAR	PARTLY CLEAR	NOT CLEAR	
		MIDDLE MANAGERS	48%	16%	36%	
		SHOP FOREMEN	46	10	44	

even more supervisors are convinced that top management is willing to listen to their ideas and suggestions. Two-thirds of both groups feel that topside actually does do something to carry out their ideas and suggestions. Does this reaction imply that middle management is at fault because it does not clear up the barriers that prevent it from being closer to the front-office type of thinking?

. . . *What this means to you:* To clear up policy matters for yourself, try the direct approach. Ask your boss what he means, and whether your implementing actions are on the beam—ED.

Question 4—Foremen feel about as confident of their general knowledge of the organization as middle-management men do. This seems to indicate that middle management is confused by what it knows and that the foreman doesn't know enough to be confused.

. . . *What this means to you:* If you've been making your foremen whipping boys for policy failures, it's time to switch the spotlight to your own performance. Speak up for more developmental training for middle management—ED.

Question 7—These foremen and middle-management men show a relatively high degree of confidence about their responsibility and authority. This may mean that they think of authority and responsibility in terms of the specific mechanics of their jobs—as opposed to the more generalized and hence indefinite understanding of company policy, handling people, or dealing with broad economic concepts. Which suggests another area of similar thinking: That the foreman and shop superintendent are brothers under the skin with respect to their familiarity with the mechanics or specifics of their job. But that both find themselves equally at a loss in dealing with the more abstract and statistical concepts familiar to the men in the front office.

. . . *What this means to you:* Human relations are nobody's baby but yours and your foremen's. It's time for you to seek self-development in this field—ED.

Questions 8 and 9—Answers appear at first to reverse the trend toward similarity. They show the expected and traditional wide variation of thinking between middle management and supervisors. This could be explained by the fact that superintendents, factory managers, department heads, and other middle-management men traditionally have offices, secretaries, bonuses, and certain other perquisites of top management that lead them to accept the fact that they are part of management. But foremen usually wear blue shirts and work from a small desk with a timekeeper and a male clerk. Even though a foreman has been told for years that he is part of management, the perquisites associated with his job have not brought him to believe it.

. . . *What this means to you:* Look for ways to upgrade your foremen's status. Like providing private offices or lounges, taking them off the time clock, showing the rank-and-file your supervisors are fully in your confidence—ED.

Question 9—Answers show that fewer foremen than middle managers feel they are in management's confidence. This may imply the breach has been widened by actions of middle management itself. What about the middle managers who carry out what top management has told them, but don't explain clearly to their foremen why such action was taken? (See "How to Make Top Policy Work at the Foreman Level," FACTORY, November 1954.) Could the result be that movements of top management become unclear and somewhat mysterious to the foreman?

. . . *What this means to you:* Don't take advantage of your position by keeping supervisors in the dark. Let them share information top management gives you—ED.

Question 10—Middle management and shop supervision react identically to the question of backing. This may indicate that they feel united in their necessity to explain cases on which they are reversed or not properly backed up—that they stand united in blaming top management. The $64,000 question is whether top management is genuinely concerned—or unconcerned—about backing them up. One point is certain: Top management often fails to back up middle management and supervision. Key point here is whether top management takes the trouble to explain why it sometimes can't back up those in middle and front-line positions.

. . . *What this means to you:* Another chance to get downward communication by carrying it upward first. Let your policy-makers know how damaging it is to your managerial effectiveness when you are reversed—especially without knowing the reason why—ED.

Question 11—The fact that 44% of the middle-management people feel that policy is not clear as opposed to 29% of supervision shows that middle management clearly is in the middle here.

. . . *What this means to you:* Could be your foremen see some of the policy trees all right, but don't know they're in a forest. To check, try quizzing them on policy matters. It may uncover gaps in their knowledge of such affairs.

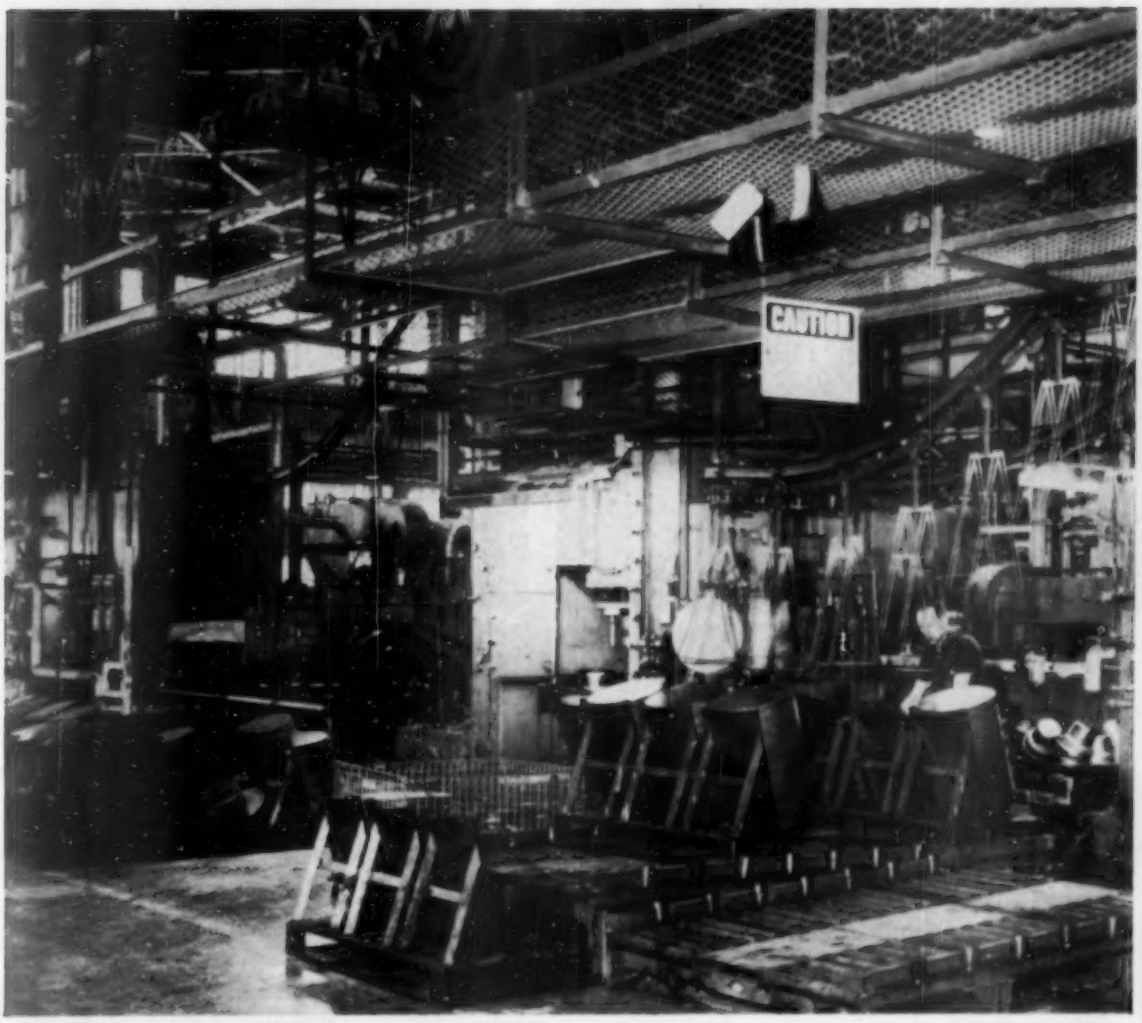
Question 12—Regarding organization structure, middle management and supervision score much the same. Do their similar views result from two different concepts of organization? To the foreman, the organization may consist of the shop. To the middle-management man, it probably consists of the whole company—or at least the whole division of the company where he operates.

. . . *What this means to you:* It's a lesson in perspective. Understanding the foreman's bottom-up view of the organization should help you in explaining your directives—ED.

Any firm conclusions?—Answers to the survey seem to boil down to this: The barrier between top and middle management can be broken down—or dented, at least—if we recognize the following:

. . . *Where genuine status has been given* to middle-management men, they respond by thinking more like top management. But where top management has professed to give status but has not really acted, middle management is likely to take refuge in thinking like supervision.

. . . *Greater emphasis must be placed* on preparing the middle-management man to function as a true, broad, modern executive. Thus he will gain a businessman's viewpoint and set an example that will encourage his foremen to improve themselves and accept top management's standards more readily.



ALL THIS is run by one man: washing and "soaping" machine (far left), two-stage draw press (center), skids of blanks (on roller conveyor), overhead conveyor, sizing press (far right). Not shown: annealing furnaces, feeder conveyors.

One-Man Processing Line

Only tops in handling makes it possible for the lone operator on this new Westinghouse production line to perform his extraordinary job.

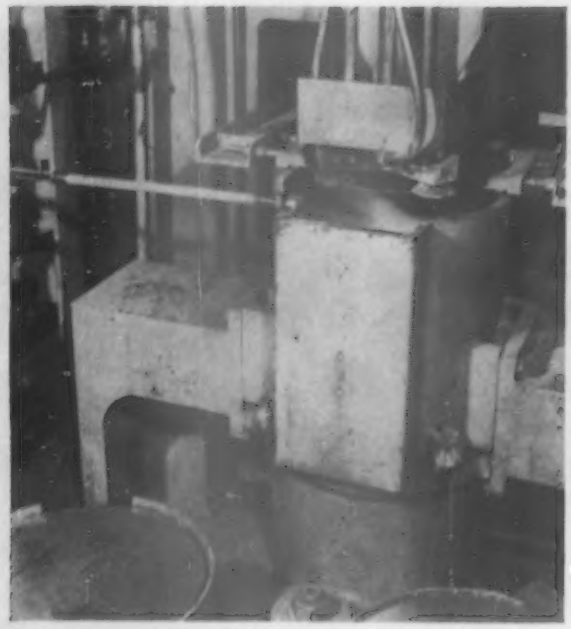
MAN IN PHOTO above works in a small area. But he runs a mighty large operation — a machine for washing and coating sheet metal with drawing compound, a draw press, a finish sizing press, two annealing furnaces, and a lot of conveyor—covering 3300 square feet.

A superman? Not at all. He just gets a lot of handling help from the automatic equipment pictured above and on next two pages.

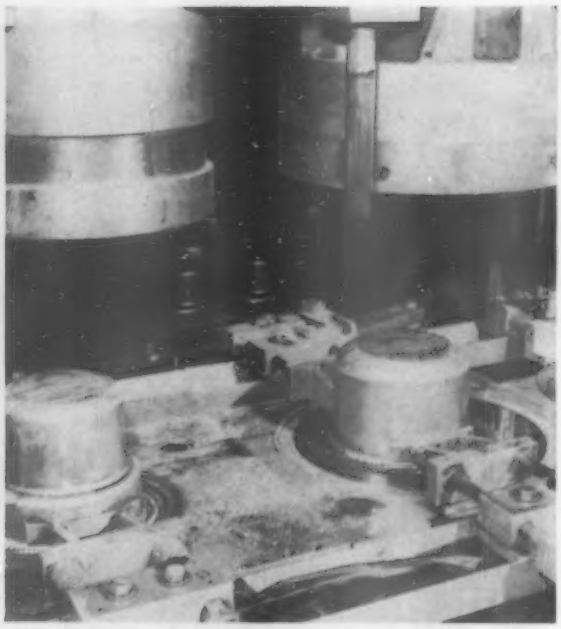
His job is to make compressor shells for refrigeration units at Westinghouse Electric Corporation's Columbus plant. Quick rundown on process: Steel discs, blanked from strip, are washed, coated with drawing compound, rough-drawn into shells by a two-stage press. Shells are washed, annealed, sprayed again with drawing compound, finish-formed in a sizing press.

This whole slick handling operation was engineered by Westinghouse. Except for the loader on the automatic press which was built to Westinghouse specifications by Clearing Machine Corporation.

Turn the page



1 **INDEXING LOADER** has three magazines. When one under receiver is empty, fresh one indexes into place.



2 **BLANKS ARE FED** to this two-stage press by grippers that take blank from suction-cup unloader (photo at left).

ONE-MAN PROCESSING LINE

Begins on page 102

How the one-man line works

The operator works in a small area, shifting from station to station as needed. Within easy reach are skids of blanks, several conveyor load and unload points, automatic draw-press loader, conveyorized bank of rough-drawn shells, controls for presses and conveyors.

Shell blanks are delivered to operator on special skids. A fork truck sets skids down on a short roller conveyor that slopes toward operator. Skids roll to position directly under overhead conveyor.

Operator removes blanks from skid, places them — two to a hanger — on overhead conveyor. He uses an air hose to separate blanks, which are hard to grasp.

The overhead conveyor carries the blanks through a washing and "soaping" machine. ("Soaping" is the application of drawing compound.) As the conveyor returns the soaped blanks to the operator's position, he removes them from conveyor, drops them into automatic draw-press loader (photo 1).

The loader is a turntable with three magazines, each of which holds a stack of blanks. As the table indexes, a full magazine is positioned under a receiver. An air piston beneath the magazine pushes the stack up into the receiver, then retracts. Catches inside the receiver hold the stack in place.

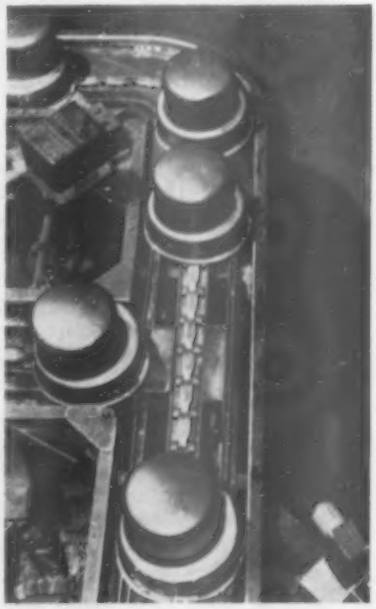
A pick-up with rubber suction cups dips into receiver, lifts a blank to carriage level of press. There a pair of grippers grabs blank, hands it to other grippers that move it through press (photo 2). Because of possible jams, which would endanger costly dies, an extra man—an observer—is used to keep an eye on the press.

Rough-drawn shells emerge from the press onto a short, inclined-belt conveyor. This conveyor carries shells to top of a chute (photo 3). On the chute, shells are divided, alternate shells going down opposite sides of chute.

Why are shells divided into a double line? Because next operation is another washing. And by using a double line, over-all length of washer can be reduced. Also, the operation after that is annealing. Two furnaces are needed to handle load. One line is fed to each.

At each furnace, shells line up against a stop while the drag chain slides along under them (photo 4). A pusher device pushes shells off conveyor, down a chute to furnace. A deflector, similar to that in photo 3, directs shells to either side of furnace conveyor.

As they emerge, shells from one furnace drop onto a main conveyor.



5 **ELECTRIC EYE** guards intersection of furnace conveyors, prevents jams.

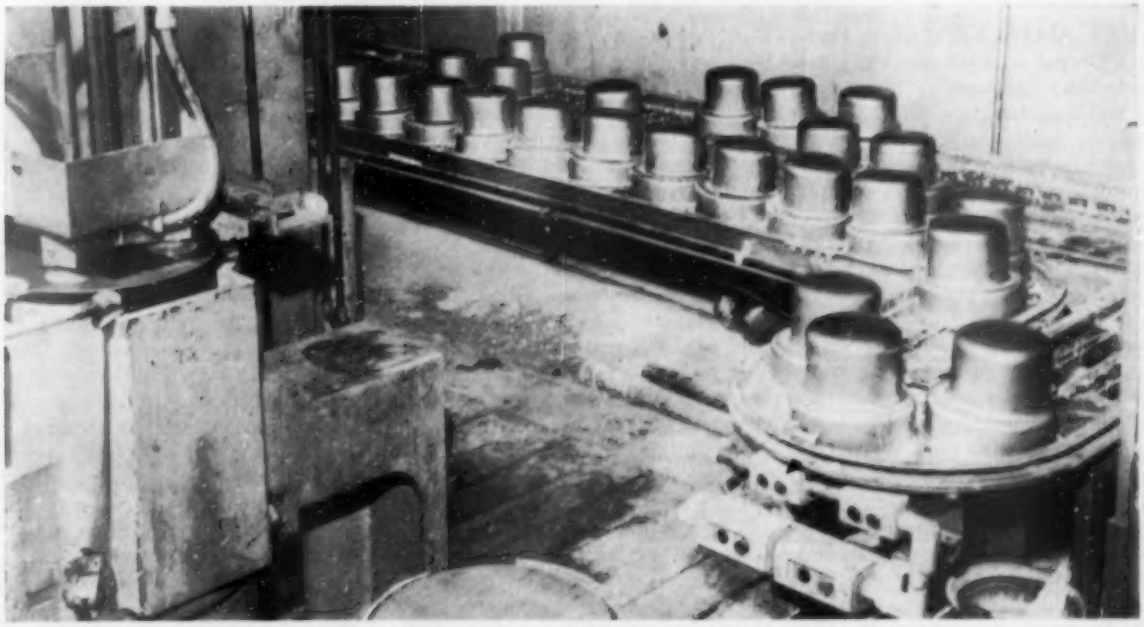
3 **DEFLECTOR** doubles up line of shells. One shell flicks arm of "T-bar," sends next shell down other side of chute.

4 **PUSHER DEVICE** unloads shells from conveyor into annealing furnace. It's synchronized with belt inside furnace.

Shells from second furnace drop onto a branch line—a short section of live rollers. This second lot is moved to a short, speeded-up drag chain, which whisks them onto main conveyor—if intersection is not blocked by a shell. If it is blocked, it's detected by an electric eye which stops the speeded-up drag chain (photo 5). Main conveyor then takes shells through a "soaping" machine, delivers them to a zig-zag storage bank (photo 6).

The zig-zag conveyor retraces its steps in a limited space. It's designed to give annealed and soaped shells time to cool, and to provide a storage bank ahead of the final sizing operation.

Final step is to take shells from storage bank, load them into sizing press, unload them, and send them along a gravity-roller conveyor to subsequent operations.



6 **ZIG-ZAG CONVEYOR** is designed to give annealed and "soaped" shells time to cool, and provide a storage bank between annealing furnace and final sizing operation. Shells pile up against stop just ahead of sizing press, await loading.

From narrow specialization . . . to skilled craftsmen . . . who

ONE REPETITIVE welding job used to be the rule at Portland. Above, Cecil Graffam is doing manual arc welding.

NOW EVERY JOB on a single assembly is handled by Cecil. Each man is trained to work on all types of welding jobs.

Turning Operators Into Mechanics

Production up. Rejects down. No quits. Since these down-Easters reversed the long-time trend to specialization and moved toward "job enlargement."

WHAT HAPPENED when Portland Copper & Tank Works (Portland, Me.) "enlarged" the jobs of 15 welding operators? Plenty. Production went up — over 20%. Rejects faded to nearly zero. Labor turnover ended — no quits or fires among welders in 27 months.

Specialists yesterday — Up until 1953 the 15 welders in the jet engine department were assigned to three classes of specialization. Eight worked solely on manual arc welding jobs; five on jobs requiring inert-gas, metal-arc techniques; two on automatic welding machines. As you can imagine, such specialization tended to create problems. There were times when welders in one group were overloaded, while those in another were sitting around just waiting for work.

Not quite so expected were a couple of secondary effects. Quality, for instance. While acceptable to U. S. Air Force standards, it lacked the appearance that only an interested craftsman can give to a weld. Morale, too, reflected the boredom induced by repetitive, nonchallenging work. And it was documented by a high turnover rate.

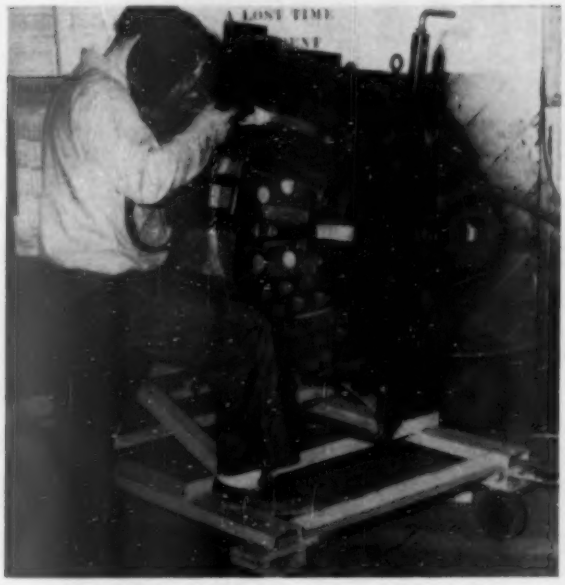
Craftsmen today—Today none of the 15 welders specializes. Each does welding in the three classes mentioned above — and equally well. Handles a variety of jobs, including semi-automatic and inert-arc welding, powder cutting of stainless steel and other non-ferrous alloys, stud welding, gas welding, brazing, carbon arc, and metalizing.

These welders are called "mechanics" now — a subtle change in job designation that they like better than the old title of "operator." Each man is set up as a craftsman in his own separate welding booth. He's equipped with the machines and tools to do almost every kind of job. When an assembly is brought to him, he'll perform all the necessary welding operations. Make his own jigs and fixtures. This flexibility of assignment often eliminates the handling involved in moving an assembly from one operating station to another.

Note how the "job enlargement" idea carries over into inspection. Rather than wait until an operation is completed, the welders voluntarily call for an inspection check on a questionable job while it's in process. This is made easy to do by placing the inspection department adjacent to the welding booths. On Air Force jobs where quality is at a premium, this pays off. Not only is the scrap pile practically nonexistent, but the appearance of weldments draws raves from visiting inspectors.

Changeover — Responsibility for training the welders in higher skills

do everything on the job . . . even make their own fixtures



HIS OWN SHOP with his own complete set of equipment is now Cecil's workplace. Cuts down materials handling, too.

DIVERSIFICATION keeps interest high. And design of fixtures like above "Ant Eater" is a challenge to ingenuity.

was assigned to Robert A. Sylvester. Bob is welding supervisor for the entire plant.

He trained two men at a time on a personalized basis. Taught both theory and practice himself. By working with the foremen to furnish a gradual diversification of work assignments, training time ran about two months per man, or four months for all 15 men.

Bob makes a point of making sure each welder knows *why* a job is done a certain way. One of the payoffs of this approach is a lessening of maintenance problems. For instance, if a welding machine began to act up, the welder would try to adjust it himself. Now he's taught to call the plant electrician immediately and let him do the fixing.

Other training devices Bob uses are training films and filmstrips he borrows from welding equipment and metal suppliers. He shows them once a week in the shop. Repeats some of them over and over again at the welders' request.

Bob doesn't teach his welders blueprint reading as such. His way is to make himself available for answering questions and giving informal advice. Since welders work with blueprints daily, some of this knowledge rubs off on them.

Through training, Portland has been able to utilize some of the more advanced welding techniques. Foot control, for example, where a microswitch arrangement cuts off power when the welder reaches the end of a weld, helps to eliminate cracks and craters.

The type of holding fixture materially affects the quality of a welding job and the time taken to finish it. And each type of welding requires a different style of fixture for best operation. Training has shown welders the principle involved in each type, with resultant improvements—not to mention important dollar savings that have frequently been made.

Topside backing—The decision to change Portland's welders from specialists to craftsmen was made by George Hugo, vice president and works manager of this 350-man plant. He believes his company should do everything it can to individualize a man's job. Says he:

"We knew we'd have to weigh the labor savings against the expense of capital equipment. Accrued man-hour savings and other benefits have proved the expenditures for this project (about $25,000) to be extremely economical.

"Modern machines require less maintenance than our older ones did. They help increase production, too. Because of higher power at starting we can use longer welding rods. This alone cuts dowtime for changing rods. Faster starting also means less time per weld."

Hugo uses a simple reporting system to feed back employee information and attitudes to him. Each job card has a spot for comments by the operator. And Hugo gets plenty. Comments range all the way from complaints of difficulty with a new alloy, to gripes about a working condition, to suggestions for improved methods. Each foreman makes a point of reading, discussing, and taking action on these comments. Hugo himself uses them as talking points as he walks around the shop. Helps make the enlargement idea a matter of management attitude and communications as well as practical job-design specifics.

Union attitude—Portland's union (American Association of Machinists) had no objections to the job enlargement idea. Union heads saw increased job security in the broader skills. Portland paid no wage premium for the changeover, either—welders' pay rates were already based upon an assumption of higher job requirements.

Low-Cost Hydraulic Maintenance...

. . . in three steps. Today's big, new trend is to hydraulic circuits for machine tools. You (like Oldsmobile) can ride the crest of the trend if you set up tough standards for equipment and train your men to service it in jig time.

TODAY, OVER 80% of our maintenance servicemen at Oldsmobile can adjust or repair a hydraulic circuit. Some six years ago few of them knew much—if anything—about this type of equipment. But now that they have learned, Oldsmobile is better off because . . .

. . . *Troubles and failures* in hydraulic equipment are few.

. . . *Repairs* are fast and sure.

. . . *Suppliers* have confidence in our specifications.

Six years ago our maintenance men were pure-bred mechanics. Good ones, too. Handled any job on gears, clutches, cranks, cams—all that sort of mechanical transmission. But then—rather suddenly—we set up our first Rocket engine line. Traditional mechanical-powered linkage was replaced by hydraulic power — pumps, pipes, valves, cylinders, and fluid motors.

This new equipment puzzled our men. They were fazed by its mystery. Didn't know how it worked. And—if asked to repair it—seldom took time to see how it was built. If they did stop to study it, they caused too much downtime.

We ran into other problems in hydraulic maintenance. Generally of two kinds. First, those arising from original engineering of circuits. For example:

1. Misapplying hydraulics.
2. Under-engineering the circuit.
3. Abusing components in layout.
4. Over-working the circuit.
5. Using special components.
6. Designing and operating on false economics.
7. Failing to provide circuit diagrams for maintenance men.

Second, we had poor or inadequate maintenance procedures at the job. For example, little preventive maintenance. Men didn't know how to trouble-shoot. They used wrong methods and tools.

Our first effort—and the subject of this article—was to teach our maintenance men the elements of hydraulics. Equally important, we sought to provide hydraulic equipment that required a minimum of maintenance during its life. We achieved these aims in three steps:

By E. R. LERCZAK
Hydraulics Engineer, Oldsmobile Division of GMC, Lansing, Mich.

STEP 1
We trained over 240 maintenance men in hydraulics.

In 1949 we hired an instructor specifically for this job. Since then, 243 electricians, machine repairmen, and pipefitters have had training. They range from helpers to journeymen—even to group leaders in the crafts. We have no classification for hydraulics maintenance. It's everybody's business—everybody must be able to trouble-shoot. There's been no change in craft set-up or organizational pattern, except for the introduction of the hydraulics engineer on the staff of the plant engineer. He aids in circuit design and layout, helps maintenance on tough hydraulic problems.

The course—96 man-hours—consists of one 4-hour class each week for 24 weeks. It's on company time. About 20 men in a class. The men are paid their normal wages during class time. All textbooks and supplies are provided by Oldsmobile. Some study is required.

Each class session calls for one hour of discussion, three hours of practice in dismantling and assembling hydraulic equipment. A laboratory has been set up with standard hydraulic circuits to work on.

The course begins with light theory, followed by 10 sessions of study on various components such as pumps, valves, cylinders, accumulators. It is filled out with a review of all hydraulic circuits in use.

Attendance has been given high priority to overcome the typical excuse for non-attendance: that men are working on a repair job. There is no change in worker classification, no increase in wages as a result of taking the course. Graduates receive a recognition certificate at a closing banquet.

We now have fewer troubles in hydraulic equipment, fewer failures. Our men know how to detect trouble, how to service, how to adjust. They are confident with know-how, don't make the mistakes of ignorance. For example, it was common practice to screw down on a safety valve to increase machine speed by increasing circuit pressure. Now our men know that other adjustments—such as volume—will do better.

STEP 2
We set standards for selecting and installing hydraulic equipment.

We did this mainly by developing sound specifications for purchase of all hydraulic equipment. A list of specs is on p. 111.

Whenever Oldsmobile is in the market for a machine tool using hydraulic circuits, a copy of these spec-

IN THIS LABORATORY, Oldsmobile's maintenance servicemen learn the practical what's and how's of hydraulic equipment and its operation. They take apart all types of hydraulic circuits, re-assemble them, and then test them.

THROUGH THIS CLASSROOM 243 of Oldsmobile's maintenance men have already passed. The course—given on company time—starts out with simple theory, then moves on to intensive study and review of hydraulic components and circuits.

POINTERS ON HYDRAULIC MAINTENANCE

DON'T assume that maintenance men know all about the hydraulic components in any piece of equipment. Even if they know how each component operates, there may be improvements in circuit design they've never seen before.	**DO** provide maintenance men with detailed manufacturer's descriptions of each component in addition to accurate and complete circuit diagrams of that particular machine.
DON'T design complex circuits just for the sake of using hydraulic components.	**DO** use other means of power transmission or control when the availability, simplicity of design, service life, and application have been proven.
DON'T conceal the purpose of a hydraulic component. Unless you know why it's used, it's hard to know whether or not it's operating correctly.	**DO** describe the function of each component in the sequence of operation that appears on the hydraulic diagram.
DON'T locate hydraulic components in inaccessible or open-to-abuse locations.	**DO** locate components in easy-to-reach places that are free from falling chips, coolant, hammer blows of operator, and similar abuses.
DON'T ask a machine tool builder to build a hydraulically operated machine as inexpensively as possible to conform to JIC hydraulic standards. The circuit will probably end up with just about every component manufacturer represented in the creation.	**DO** specify the makers of hydraulic components, as well as JIC standards, that you want.
DON'T use tiny hydraulic reservoirs that will boil the oil.	**DO** use reservoirs that are large enough to radiate the heat resulting from circuit inefficiencies. As a general rule, reservoir capacities should equal three minutes of the maximum pump delivery.
DON'T include hydraulic components in any design for which the stockroom has no replacement parts. Only exception is when the application is very special and the available equipment is not capable of doing the job.	**DO** try to use stock components in circuit design. If you must use special components, be sure to arrange for replacement parts.
DON'T just locate a hydraulic cylinder in equipment and attach the piston rod to the work. You can expect leakage for sure.	**DO** design the equipment so that the piston rod aligns with the bore of the hydraulic cylinder at every position of the stroke. If necessary, design ways that run the length of the bore, to maintain alignment.
DON'T hang hydraulic components on the piping. Pipe threads are second only to piston rod packings and seals as a source of oil leakage at Oldsmobile.	**DO** use gasket-mounted components, or support the components independent of the pipelines.
DON'T ride close to the theoretical design limit of 15 fps. in fluid flow when sizing hydraulic pipelines and components.	**DO** engineer a safety factor into the hydraulic circuit. Design around hydraulic shock to avoid broken lines—a third major source of oil leakage at Oldsmobile.

ifications goes with each request for quotation. Quotations are analyzed in terms of their individual merits. If a quotation lists a deviation from JIC (Joint Industry Conference) standards, we analyze the deviation further to determine whether insistence on the standard is sound, or whether we should waive the point. We permit few waivers—and those with reluctance.

Good design a factor—Low-cost and trouble-free maintenance always begins with good design. At Oldsmobile, we guide our hydraulic circuit design by four objectives:

. . . *A built-in safety factor* that will permit an increase of at least 50% in production.

. . . *Accessibility.*

. . . *Simplicity.*

. . . *Highest pressure rating* of a component.

Of these, the first and fourth are not JIC requirements. They are strictly Oldsmobile policy.

STEP 3
We limit the number of suppliers of hydraulic components.

If we didn't, our stockroom would be deluged with a variety of parts. Also, though many parts are functionally similar, their different mounting dimensions would prevent wide use throughout the plant.

But our lists still may show as many as five sources for one component. They cover mostly pumps, valves, cylinders, accumulators, fittings, and hoses.

Such lists should not be taken to mean that the favored suppliers have better equipment than their competitors. They do mean that the specific components have been consistently acceptable from the standpoint of quality and delivery.

It must be added that the machine tool builders serving Oldsmobile have not objected to this policy. In fact, some of them have commented favorably because it assures the builder that his competitors cannot gain an unfair advantage by cutting corners to economize at the expense of extended good performance.

Coming in FACTORY—Another article by Oldsmobile's Mr. Lerczak. In it, he'll tell how Oldsmobile has set up adequate maintenance procedures for hydraulic equipment.

STANDARDS FOR BETTER HYDRAULICS

Stick to these specifications (some are inspired by JIC), and your equipment will stand the gaff of heavy production.

A. All hydraulic components must conform to the Joint Industry Conference Hydraulic Standards for Industrial Equipment, or the latest revision thereof. Oldsmobile exceptions and additions to the JIC standards are listed below. Vendor shall state on his proposal that he will comply with these standards. Written approval of any deviation from these standards must be secured from the Oldsmobile plant engineering department.

B. Proposed hydraulic circuit approval must be secured from Oldsmobile's plant engineering department in time to incorporate suggested changes on the equipment without affecting the contracted delivery date of the equipment. A "Van Dyke" or intermediate copy of the final diagram is to be in possession of the Oldsmobile plant engineering department on the day the equipment is shipped.

C. Circuits are to be designed to operate within a maximum of 1000 psi.

D. Fluid velocity in component connecting pressure lines is not to exceed 10 feet per second.

E. Circuits are to be designed to operate at maximum rated production within the reservoir temperature range of 50 F. minimum and 130 F. maximum, without the use of heat exchangers. Ambient temperatures at Oldsmobile range from a minimum of 60 F. to a maximum of 100 F.

F. Hydraulic and lubricating systems shall be separated, and fluid from the hydraulic system shall not be used to lubricate ways, slides, exposed surfaces, or mechanisms not integral with hydraulic components.

G. Only JIC-approved fittings of specified make are to be used. Fittings must be interchangeable.

H. Piping runs are to be supported by shock- or vibration-absorbing material in that section of the support that comes in contact with the line. Supports are to be mounted to a stationary member of the equipment at maximum intervals (table below). Only the tube size and wall thicknesses listed below are to be used with the specified fittings. When larger sizes are required, flanged connections are to be employed.

Tube O.D.	Wall Thickness	Lengths Between Supports	Tube O.D.	Wall Thickness	Lengths Between Supports
¼ in.	0.035 in.	3 ft.	¾ in.	0.065 in.	4 ft.
⅜ in.	0.035 in.	3 ft.	1 in.	0.095 in.	5 ft.
½ in.	0.049 in.	3 ft.	1¼ in.	0.120 in.	6 ft.
⅝ in.	0.065 in.	4 ft.	1½ in.	0.134 in.	6 ft.

J. Though the use of high-pressure hose is not desired, when its use is unavoidable use only hose with corresponding fittings. The flow velocity of 10 fps. is applicable to the high-pressure hose.

K. Only the following makes of pumps, valves, and fluid motors may be quoted: . . . Combinations of different manufacturers are not to be used on any piece of equipment unless specifically approved by Oldsmobile's plant engineering department.

L. Cylinders using the automotive step-cut rings on the piston may be quoted from the following makes only: . . . Cushions are to be incorporated on both ends of stroke.

M. Only . . . -type gas-loaded accumulators may be quoted, and only the following makes: . . .

N. Use . . . strainers, with 0.0025- to 0.004-in. openings, on the intake line of each pump.

P. Use . . . by-pass filters. The fluid is to be circulated through the filters with an independent pump. Indicators, to determine when the cartridges are to be changed, are to be located in such positions that they can be read at a glance, without the use of any tools.

R. Each main hydraulic circuit is to be equipped with . . . gages of the proper capacity. Shut-off valves are to be installed between the lines to be checked and the gages.

S. The hydraulic circuit is to leak no more than 1% of the reservoir volume per week for the first three months after installation.

EXPLANATORY NOTES

A. Oldsmobile insists on conformity with JIC Hydraulic Standards except where otherwise stated. These standards were devised to cover hydraulic equipment in general applications. Oldsmobile has found it advisable to be more stringent in some respects, more lax in others.

B. We use this way of checking availability of replacement parts (oil, pumps, valves, etc.). We don't want hashed-up circuits. Furthermore, the variety of parts is minimized by using parts we know are already on the stockroom shelves. This helps maintain a high standard of quality in replacement parts. And we want to keep out poor equipment. A "Van Dyke" makes it possible to replace dirty copies of circuit diagrams on the floor with prints from the file copy kept in the office.

C. Purpose is to eliminate leakage. Some applications, however, such as large presses, require a higher pressure to be practicable. In such cases, we waive the 1000-psi. limit.

D. This point is waived on occasion. But usually Oldsmobile lets the velocity limit stand. This low rate of 10 fps. takes care of production increases, which happen frequently. Thus we get a built-in safety factor and don't have to touch the lines for production boosts. And there's no washing the guts out of parts by excessive velocities.

E. We don't like heat exchangers. What sense does it make to produce horsepower, then employ utilities and mechanisms—which require maintenance service—to dissipate the power that isn't used?

F. Since film strengths of hydraulic and lubricating oils differ, it's obvious the first should not be used to perform the function of the second.

G. Interchangeability reduces spare parts inventory, makes adjustments easier.

H. Proper support of piping minimizes fatigue breaks at the terminals. We are about to add wall hardness to this tabulation. Proper thickness and hardness give greater tube life, yet permit easy flaring and bending. We have found that at a bend, wall thickness can vary up to 20% less than normal. This can be a point of weakness unless heavier tubing is used.

K. L. M, N, P, R. Names of vendors have been omitted for obvious reasons. But this restrictive feature helps keep quality of components consistently high.

S. As a rule, adherence to this requirement insures proper seals and good lifetime performance of all types of hydraulic equipment.

FACTORY | IDEAS OF THE MONTH

By LEWIS K. URQUHART, Managing Editor, FACTORY

Mighty Movers (Acorn Co., 1482 S. Milwaukee Ave., Denver 10) will get a big hand from your maintenance department. If it's ever called upon to move machines. That's because MM's are king-size roller skates that carry up to 90 tons. Negotiate rough floors. Cost? $187.50 per set of four.

Hydro-electric work tower (Cramer-Krasselt Co., 733 N. Van Buren St., Milwaukee 2) plugs into any 110-volt a-c outlet. Motor operates a hydraulic pump to raise work platform from 7 ft. to 17 ft. above the floor—in 25 sec.

Next an electronic sound absorber. Seems a microphone, an amplifier, and a loudspeaker are connected to form an electro-acoustic feedback system that reduces sound-pressure variations in vicinity of mike. It's being developed at RCA Laboratories, Camden, N. J.

Elevoice, in case you haven't heard it, says "Going up" and "Out five, please." Even warns offending passengers to step aside and let the doors close. Or delivers other special messages. It's optional on automatic elevators built by Otis Elevator Co., 260 11th Ave., New York 1.

New collating wheel is for you, if collating is one of your problems. Speed is timed to give operators working around the wheel ample time to pick up, joggle, and stack. Each operator can collate a 112-page booklet in 90 seconds. Johnson Research Corp., Bethpage, N. Y.

Rubber slurry valves are what the doctor ordered for better control of abrasive and corrosive flows. Certainly a far cry from pinching the tube. Equipment Engineers, Inc., 41 Sutter St., San Franscisco 4.

After you've read "Why don't you come to Greenfield?" you'll be looking up trains! For booklet containing all the reasons why you should locate your new branch plant in this beautiful Massachusetts town (pop. 18,000), write to the Development Industrial Commission.

When Schoolmate meets Recordmaster, you've got a package for projecting sound slides and filmstrips. We're talking about Bell & Howell's projector and DuKane's transcription player. Complete with case, $149.50. Details from B & H, 7100 McCormick Road, Chicago 45.

Magne-trol is a magnetic steel board on which visual aids are placed to present facts. Use it for scheduling, machine loading, plant layout, etc. Methods Research Corp., 441 Mosel Ave., Staten Island 4, N. Y.

Handwriting on wall says you'll be shipping by air eventually. Why not now? Whole story is in "A graphologist's guide to Air Express." And AE (219 E. 42nd St., New York 17) will be happy to send you a copy.

Booklet of the Month invites you "to be Plant Superintendent today . . . and see first-hand the equipment we have for our customers' custom-designed requirements." The "we" is Fritz W. Glitsch & Sons, Inc. (POBox 6227, Dallas 2). Ideas here for you if your company needs to tell its story.

The coffee break now being practically a national institution, you'll naturally want to know about the "honor system" worked out by Coffee-Ette of America, Inc. (90 Clairton Blvd., Pittsburgh 30). And just as naturally about that new water cooler (Ebco Mfg. Co., 265 N. Hamilton Rd., Columbus 13) that also delivers hot water from which employees make their own coffee, hot chocolate, beef broth. Both are self-service jobs.

Roto-Kard is that new space-saver of Remington Rand's (315 Fourth Ave., New York 10). This record-keeping unit takes up only 3.6 sq. ft. of your valuable floor space, yet will hold 6000 8x5 cards.

New all-paper pallet for unitized bag shipments has been developed by Monsanto Chemical Co. (Springfield, Mass.). Semi-circular channels, made by splitting a 6-in. spirally wound paper core, are spaced 24 in. apart to accommodate lift truck forks. A sheet of 90-lb. wet-strength Kraft paper bonded to back of paper cores serves to establish a loading pattern, as well as to keep bags off floor.

Dry-mist paint is one good answer to that old problem of damage from wet paint mist settling on adjacent surfaces. For details write Phelan-Faust Paint Mfg. Co., 932 Loughborough Ave., St. Louis 11.

Coming up! A way to measure the strength of individual pieces of timber by using high-frequency sound waves. For details write Timber Engineering Co., 1319 Eighteenth St., N. W., Washintgon 6.

Immersion in muddy waters caused by Hazel did microfilm records no real harm. Recordak Corp. (444 Madison Ave., New York 22) reports 400,000 ft. washed, dried, and returned to customers good as new.

For Christmas, give him "Mechanic Maker"—an educational toy lathe (Winkle Mfg. Co., 3751 Montgomery Rd., Cincinnati 12). Weighs 16 lb., is 27 in. long, stands 9 in. high, has a 1/35-hp. motor. No gears, no belts, no fingers in the machinery! Cuts wood, plastics, aluminum. His for $34.95.

1. Teach workers not to abuse tools

MOCK GRAVE is one of Carrier's dramatic exhibits that stress tool care. Here a foreman ponders grave filled with damaged parts from all over plant. Posters overhead represent the "Six Faithful Serving Men"—What, How, Where, Why, When, and Who—of portable tool care and use. Company educates workers in good tool habits by displays of latest tools and their cost, color slides showing damage caused by neglect or careless use, booklets on operation and safety.

How to Insure Power Tool Payoff

Big secret, says Carrier, is to keep those tools working harder. And here, for you to swipe and put to work in your plant, is Carrier's six-step program.

EFFECTIVE tool control takes more than control cards. You need a system that watches tool abuse as well as tool use. Carrier Corporation, Syracuse, has a system like that. There, investment in portable tools has increased 45% (to $1-million) in the past five years. Payoff for Carrier's system:

. . . Repair costs down 20%.

. . . Downtime substantially reduced. Almost any tool that breaks down can be replaced in 10 minutes.

. . . Tool maintenance staff same size as five years ago.

. . . Safety record maintained at top-notch level.

Carrier had to face the fact that methods of tool care and use had not kept pace with new tool purchases. And resistance to change was keeping new tools from paying off. So Carrier first had to convince its people that something must be done. Next step would be supervision of tool use and tool management—all the way down the line—a top-to-bottom shakeup in tool handling. The system would have to promise returns on tool investment.

You can see what Carrier did—and does—on these and the next two pages. Results: (1) Supervisors and operators know cost—and use—of tools and parts. (2) Repairmen are technicians—able to trace the causes of damage as well as repair it. (3) Everybody is concerned over tool control and maintenance.

3. Track down causes of tool abuse

MAKESHIFT REPAIRS, for example, can cause trouble. Operator (left) welds guard to tool because he has lost part of screw-on holder. Guard will cause its own destruction, burn bearing race on spindle support, strain motor. And ball bearing, spindle, and locknut will have to be replaced. This really happened once. But it won't again. Maintenance men now track down causes of damage and eliminate them.

EFFICIENT STOCKING of parts cuts inventory investment. You need an adequate supply to service tools properly. But Carrier selects tools that use many of the same parts, thus gets the most for its inventory money.

2. Install an orderly tool repair system

REPAIR RECORDS, like the report this man is filling out, are kept by superintendent of department concerned. They show labor and parts used, and total cost of repairs. Help eliminate tool abuse. Foreman of the repair department also keeps repair-record card for each tool, plus daily repair summaries. Parts and labor are entered on individual punch cards.

Turn the page

4. Keep close tab on where tools are

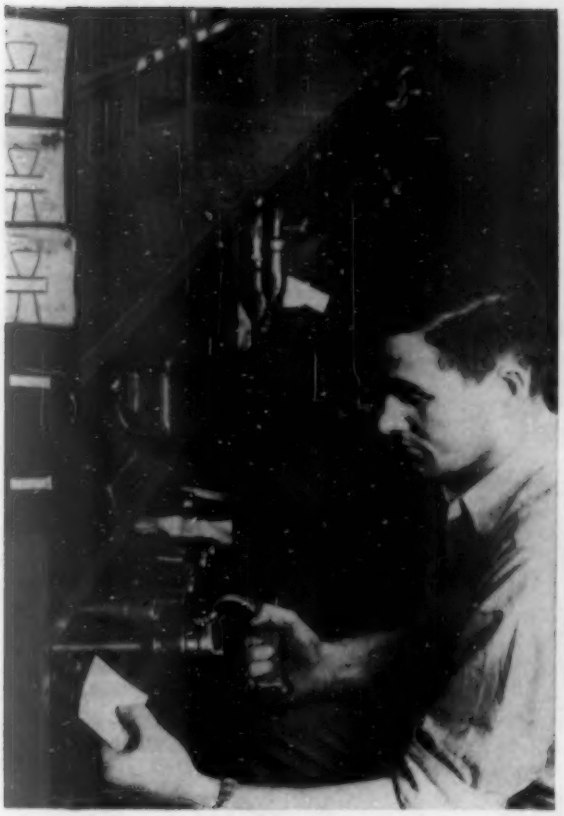
RECORD ALL TOOLS. Before tools—whether old, new, or repaired—are sent to cribs, they must first clear through Carrier's central power-tool maintenance department—heart of the system. File cards describe each tool, tell where it's kept. Copies are held in this central department, in crib concerned, and in tool superintendent's office. Serial number is stamped on the body of every tool for quick identification if the number wears off the nameplate.

INSTALL TOOL CHECK system at cribs. Operator fills out three-part form, which serves as tool check. Two copies are filed in control board when tool is issued. One copy—goes to

5. Keep tools in good working condition

RIGHT TOOLS for checking torque, speed, air pressure at job are shown above. Carrier finds tools in foreground adequate for most routine preventive maintenance. In background are strobe lamp, large torque wrenches, tachometer kit.

PREVENTIVE MAINTENANCE program aims at once-a-month schedule. Tools returned to cribs are routed through central tool maintenance for routine check-up and lubrication. Any repairs needed are completed as soon as possible.



operator. When tool is returned, crib attendant compares serial number with operator's receipt. First two copies are removed from control board and destroyed.

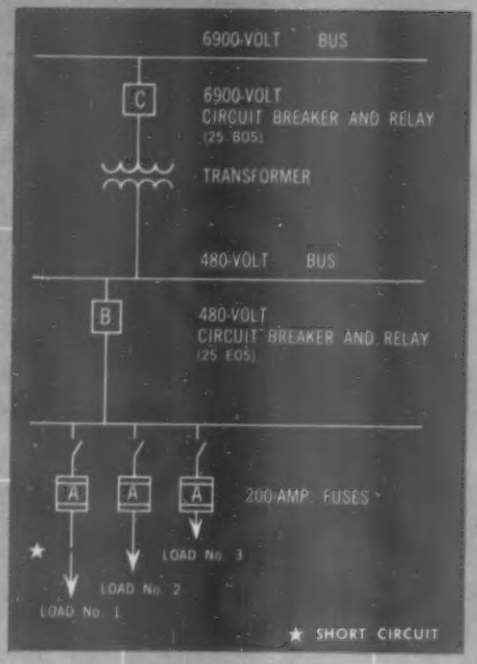
FOLLOW UP LOST TOOLS. Carrier has a "Bureau of Missing Tools" for this purpose. Immediately on learning a tool is missing, operator reports and turns in his receipt for the tool. Toolcrib attendant enters the item on his lost-tool inventory. A second copy of the tool check is placed in an envelope—to be filed under the worker's name. If the missing tool is found later, then his record is cleared. Otherwise, records are accumulated to help spot and put an end to epidemic losses.

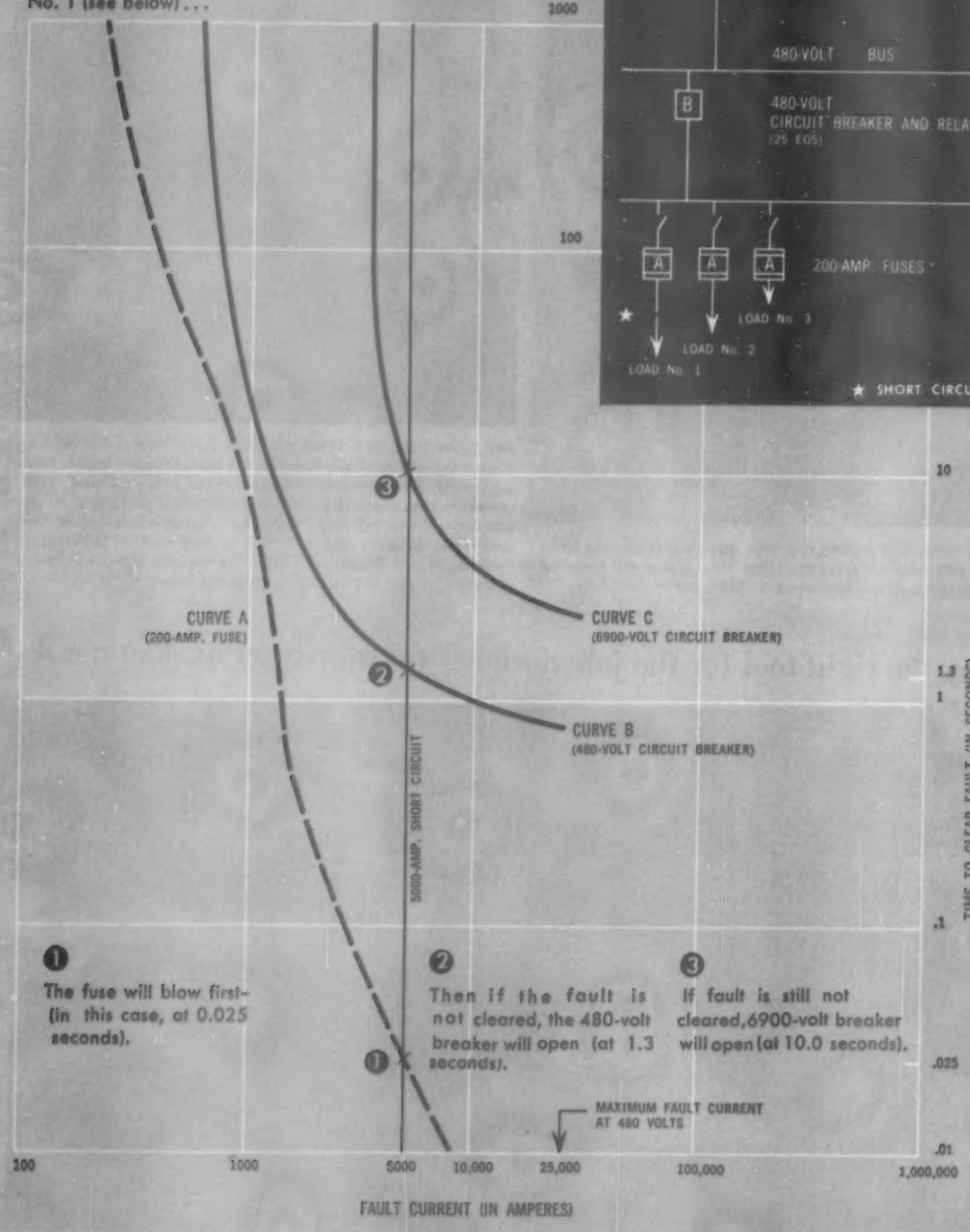
6. Buy the right tool for the job

REPAIR RECORDS show past performance of tools, determine best buys for future. Master records from daily summaries—also superintendents' repair reports—are helpful. From them, Carrier's superintendent of perishable tools and supplies knows which model of impact wrench to specify on the purchase requisition he's in the act of signing.

HOW RELAYS SHOULD WORK

The time-current curves below show the operation of each of the protective devices in the circuit to the right. Since the relays are coordinated, for any value of fault current a minimum of protective devices will open to isolate the fault. For example, for a fault of 5000 amperes on Load No. 1 (see below)...





CORRECT PROTECTION for circuit at upper right shown in these curves. Vertical line through any value of fault current will show that protective devices will operate in the correct order: fuse, 480-volt breaker, 6900-volt breaker.

Are Your Relays Working?

Working right, that is? Because every time breakers open that needn't have opened to protect your electrical system, you're getting hit hard by needless downtime.

UNLESS YOU'RE an electrical engineer, you probably don't know that the diagram on the opposite page means money to you. It does, though. It shows how relays—little gadgets tucked away somewhere in your switchgear—can parlay a simple electrical fault at some motor or switch into a needless, costly stoppage in your plant.

The job of these relays is to open enough circuit breakers—whenever there's a fault in your system—to isolate that fault. That means there's a production shutdown every time they operate. And the shutdown gets top-priority attention from everyone. What few people realize is that, unless your relays are operating just right—and there's no reason to assume they are—there's a distinct possibility the relays have made a mountain out of a molehill — opened circuits that *needn't have been opened* to isolate the fault.

Does anyone pay much attention to this problem? Probably not. But the study just completed at the Bayway Refinery of Esso Standard Oil Company (Linden, N. J.) *indicates clearly that people should.*

Like many oil refineries, Bayway previously relied on steam drives to augment electrical facilities on process units. With the development of modern electrical equipment, it was found advisable—from an economic and control point of view—to design new refinery units that place full reliance on electric power. So it was necessary to review the entire electrical system in order to insure a high level of dependability.

Esso engineers found that, to bring their system into optimum operation, 15% of all the relays in the plant had to be replaced. And 60% of the others needed some kind of adjustment. When their field work is finished, premature operation of breakers caused by improper relay coordination will be a thing of the past. Also, unnecessary and costly outages caused by such false operation of breakers will be cut sharply. And an absolute minimum of breakers will be tripped to isolate any fault from the system—thus minimizing the extent of any shutdown.

Just how do relays "make a mountain out of a molehill?" Take the substation diagrammed on facing page. Suppose there's a big fault on the feeder to Load No. 1. Ideally, the 200-amp. fuse (*A*) would blow, removing the fault from the system. But often—unless the relay controlling the opening of 480-volt breaker (*B*) is set just right—the fault on the feeder will cause the breaker to open *before* the fuse isolates the fault. Which puts the feeders to the other two loads on the line out of service—for no good reason. The unnecessary downtime on the other two feeders is the direct result of just one thing—faulty relay coordination.

This actual case from Esso's experience doesn't seem too bad. But suppose a fault on some ventilating fan motor caused a shutdown on the main assembly conveyor in your plant. And figure that over the years you might have hundreds of such occurrences. That will answer the question: Why is a relay survey worthwhile?

The size of the problem—Esso's plant has a big electrical distribution system—about 30,000 kva.—and it's expanding rapidly. More than 2100 relays are used to control the operation of about 700 breakers. These relays must be adjusted to coordinate—as described in the simple case above—with over 300 important fuses.

Survey not an easy job—When Esso started the Bayway survey, it found it suffered from a common problem. It needed to update many of the one-line diagrams of its distribution system and to supplement the existing data on operating characteristics of relays, fuses, and circuit breakers. Also, the numbering system for identifying and indicating the function of the components in the system had to be polished up.

To do a proper job of protecting a circuit, relays must differentiate between permissible operating conditions and abnormal conditions such as shorts, grounds, overloads, over-voltages and under-voltages. So, to correct all relay operation, Esso needed detailed information on the system. Field work had to be done to supply the necessary data. And Esso wanted the job done fast so that service conditions would not change to any appreciable extent during the course of the survey. So it employed the consulting engineering firm of Anderson-Vreeland Company (New York City) to do the job.

How system was adjusted

Before any corrective action could start, engineers had to take the following steps:

. . . *Inspect the system.* Engineers inspected and obtained name-plate data on every component in the distribution system—not just relays, but breakers, fuses, current and potential transformers, meters, power transformers. All these data were accumulated on data sheets.

Turn the page

DO YOUR RELAYS WORK?
Begins on page 118

. . . Devise a numbering system. Each substation and unit of a substation were assigned a number according to physical location, voltage classification, and function. For example: Circuit breaker *B* is numbered 25E05. By referring to a master numbering guide sheet, you can determine that it is fed from the Yard-Office Substation (which is substation No. 25), from a 480-volt bus (E indicates 480 volts), and it is in the fifth panel position (05). Each unit has its number painted on for easy identification.

. . . Prepare single-line diagrams. Existing single-line diagrams were revised, and new ones drawn where necessary, to cover the entire distribution system. Each component was numbered according to the system just outlined.

. . . Compile relay operating data. There are many types of relays. Some operate instantaneously on any greater-than-normal current. Others operate after a certain time interval different for each level of fault current. For each relay in the system, the time-current characteristics were determined from information supplied by the manufacturer. The curves on the chart on page 118 are samples of this form of information. These curves were checked during the field inspection.

. . . Maximum short-circuit currents were established. Esso electrical engineers made a study to determine the maximum short-circuit currents that could possibly occur on each substation bus.

Relays then re-set—With this information in hand, engineers were ready to adjust the relay system. The main purpose, remember: to coordinate all protective devices on a circuit so that only the breaker necessary to isolate a fault is opened.

This was done by starting with the protective device nearest to the load. It was set to protect just its load. Then, working toward the power source, all other protective devices were set so they would not operate unless protective devices further down toward the load had not already isolated the fault. Easiest way to illustrate is to go back to our example:

In the diagram on page 118, the protective device nearest to the load is a 200-amp. fuse (*A*). A time-current curve for this fuse was drawn, working from data supplied by the manufacturer (as outlined earlier). This is shown as curve *A* on the chart. The next protective device toward the power source is breaker *B* (25E05). In the original installation, this breaker was an instantaneous direct-acting trip breaker (not shown on diagram), set to operate at a fault current of 1000 amperes.

Now this breaker was an instantaneous device only for fault currents of 1000 amperes or over. For a lesser fault, the fuse would blow before the breaker tripped, isolating fault without affecting breaker. And all other loads on that circuit would continue to operate. But if fault current were *above* 1000 amperes (and it could go as high as 25,000 amperes, for instance, on a phase-to-phase fault), the breaker would be tripped *before* the fuse blew. This would interrupt power not only to the feeder with the fault, but to all other feeders protected by that breaker. Which is, of course, what Esso set out to avoid.

Clearly, another kind of relay was needed. An inverse-time overcurrent relay was picked. (Operating principle of this type of relay: The higher the fault current, the faster the relay operates the breaker.) This relay is adjustable in two ways. By changing tap settings, you can change current level at which relay will operate. By changing time-dial settings, you can change relay-operating time. By changing tap and time-dial settings, you can get a family of time-current curves for a single relay.

In the case outlined, Esso found that a tap setting of 6 and a time-dial setting of 5 gave the curve shown on the chart (*B*). Notice that for any value of fault current, this relay will not open the breaker before the fuse blows. That is, fuse will blow first. Then, if fuse fails to operate, the relay will trip the breaker. And this is what Esso wanted to accomplish.

The time-current characteristic curve of the next protective device in the system is also shown on the chart. It's the curve *C* for the transformer breaker *C* (25B05), which isolates the entire substation from the incoming 6900-volt line. Notice that it's also "in coordination" with the two other protective devices (breaker *B* and fuse *A*); will not open unless both the fuse and the 480-volt breaker have failed to operate. For example, in the case of a 5000-amp. fault (as shown by the white vertical line intersecting all three time-current curves—*A*, *B*, and *C*), the protective devices would act in 0.025 second (fuse), 1.3 seconds (480-volt circuit breaker) and 10.0 seconds (6900-volt circuit breaker).

This is the type of study and change that Esso applied to every segment of its distribution system.

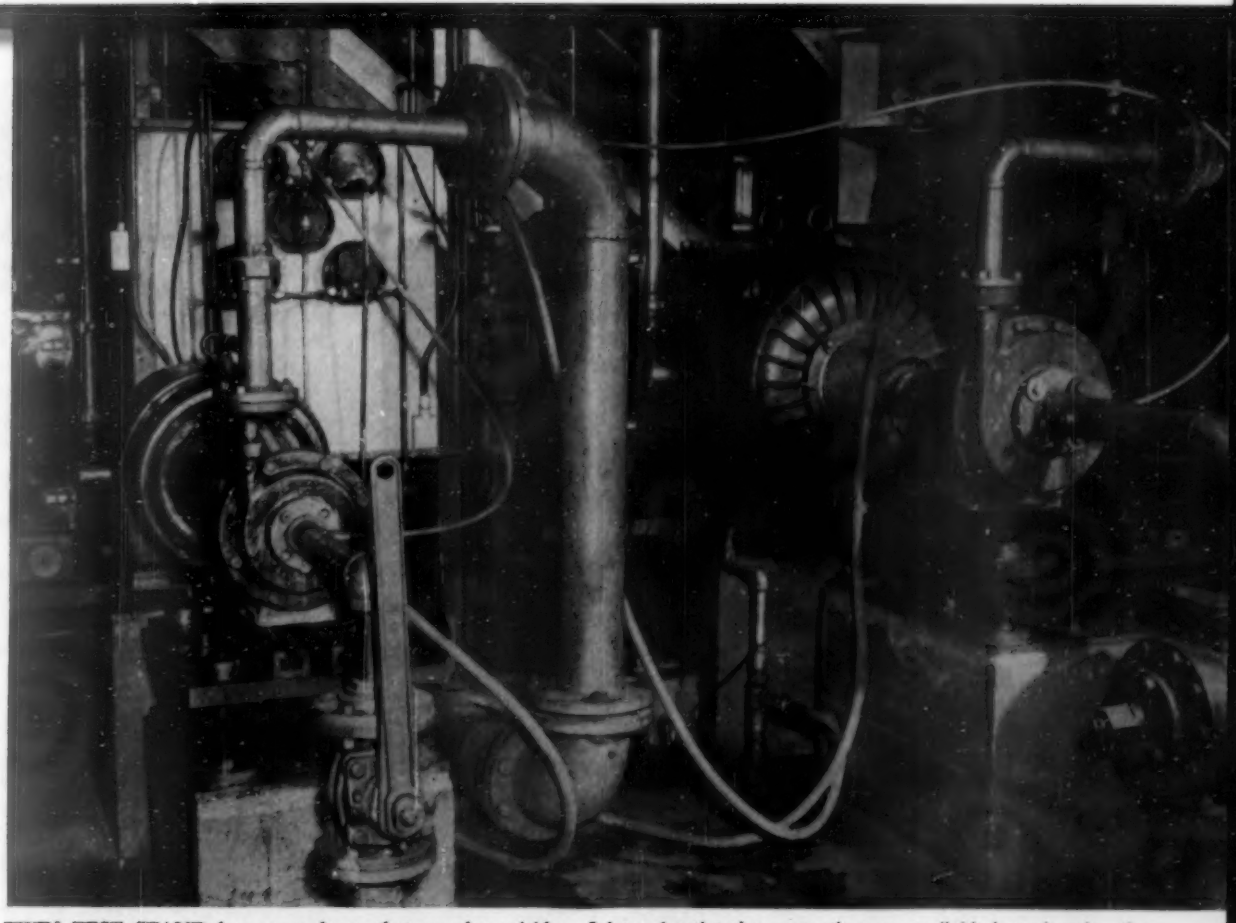
Follow-up required — Now that Esso's system is properly adjusted, company engineers don't plan to relax. Relay data books will be kept up to date, by noting all system changes that would change relay requirements — making further relay adjustments when necessary. And an electrical preventive maintenance system is being set up. Relay settings will be checked and calibrated at least once a year — more often in critical areas.

Now You Can Really Measure Your Maintenance Performance

From Du Pont comes a simple graphic method that tells you how you're doing maintenance-wise. That pinpoints the steps you need to take for improvement. A method any plant can adapt for its own use.

An exclusive FACTORY REPORT of a brand-new arrangement technique

. . . coming next month



TWIN TEST STAND has pump bases that can be quickly raised or lowered. Adjustable T-slots make for easy installation. Inlet and outlet pipe connections are available in various lengths and sizes to meet almost any need.

Pumps Now Match the Job

Here's a neat setup for testing process pumps that is paying big dividends because it eliminates guesswork as to what a pump can actually do.

AS A BIG USER of centrifugal pumps—thousands of them—Dow Chemical has found it pays to keep tabs on pump performance.

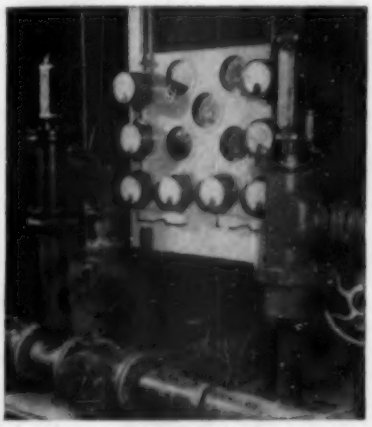
We set up a pump test stand in 1948. Improvements were gradually added. Now we have a program in high gear that leads to better selection, operation, maintenance, and repair of centrifugal pumps.

Here are six good reasons our pump test stand is now in use almost continuously:

. . . 1) Better pump application. Our engineering department had always wanted pump characteristic curves for pumps used in production and sent back to the shop for reassignment. The reliable curves now available insure proper application of each such unit.

. . . 2) Reliable overhaul. Often when processes ran sour, production departments questioned whether a pump had been properly overhauled. Pump curves now take out this element of suspicion—tell exactly what the pump will do. All pumps overhauled in our shop get a performance test. This test usually involves only a check on head and capacity, which are recorded and filed. But when the engineering or production

By JIM VAN HAFTEN
Staff Engineer, Plant Maintenance Engineering, Midland Division, The Dow Chemical Company



GAGES on instrument panel and flowmeters in pipelines are permanently installed, need no other connections.

PUMPS NOW MATCH THE JOB . . . *Begins on page 121*

departments request a pump curve, a complete test is run.

. . . 3) New pump check. New pumps are tested on request. The purchasing department now has a way of checking performance on a new pump to see if it meets all specifications. The engineering department also gets this report.

. . . 4) Proper motor match. By knowing horsepower requirements of a pump, we are now able to select the right size motor. We avoid over-sizing of motor, which was frequent in the past. And if a motor seems overloaded, the pump is brought in to check horsepower.

. . . 5) Maintenance improved. Shops are now able to check up on bearing problems and get at the real trouble. So we are gradually eliminating such worries. The same thing holds for our packing problems. Whenever we install mechanical seals we can check the pump and adjust the seal before the pump gets into the production line.

. . . 6) Efficient performance. Due to the great variety of products pumped in our plant, we needed a means to check the effect of different impeller diameters and designs. Now we can choose the type we find is most efficient for the purpose.

Pump test equipment—We have a two-station pump test stand which is located over a pit holding 8000 gallons of water. You see the front and rear view of the stand in the pictures on p. 121. At each station the pump is driven by a calibrated electric motor on which the watt input can be measured against the horsepower output. These motors have four speeds, rated as follows:

Small Motor

20 hp.	3500 rpm.
10 hp.	1750 rpm.
6.7 hp.	1150 rpm.
3.3 hp.	580 rpm.

Large Motor

100 hp.	3500 rpm.
50 hp.	1750 rpm.
33 hp.	1150 rpm.
17 hp.	580 rpm.

Each motor is equipped with a drum controller that gives speed changes in both directions. Each pump base is arranged for different bolt spacing, and can be raised or lowered as needed to line up with the motor.

The flow of water is measured on flow meters, of which there are three—as follows:

. . . 0 to 50 gpm. (used with small stand).

. . . 0 to 250 gpm. (used with either stand).

. . . 0 to 1500 gpm. (used with large stand).

Pressures are read in feet of water, and in some cases in pounds per square inch. Water pressure at inlet and outlet of pump is measured with a large dial bourdon-tube gage, with small hose lines running to pipe connections. In each discharge line is a gage giving readings in pounds psi.

We can test almost any horizontal pump up to 5x6 inches with our equipment. Stand is also used to test turbine and sump pumps with a few mechanical changes.

Since water level is below center of the pump, we have to draw water up into the casing with a small air jet before starting pump. We do not use a dynamometer to measure power input to pump because in our type of testing such extreme accuracy is not required.

Maintenance problem of this installation has been small. We have found the stand to be versatile and can place pumps on it for testing with a minimum of time.

YOU BE THE ARBITRATOR

THE CASE OF

The Retracted Merit Increase

Out of the experience of the American Arbitration Association

A union contract in an electric switch company called for automatic raises within each labor grade from minimum wage to a point 5 cents below top of the scale. Final increase was for merit. But "retention of a rate assigned on a merit basis is contingent upon the operator meeting job requirements."

Barbara T., a kick-press operator, in Labor Grade 3, reached the automatic maximum. Soon she was given the 5-cent merit increase. Later, it was necessary to transfer her to another type of machine in the same grade. Management felt justified in reducing her rate 5 cents.

"That's discrimination," Barbara protested. The union steward agreed. "Barbara earned the raise to the top of her range, and you can't take it away without cause."

"Barbara earned the merit increase by excellent work as a kick-press operator," answered her foreman. "She's not as experienced on the new machine as on the old one. When she begins doing superior work again, she'll get her nickel."

Finally, the case went to arbitration. If *you* were the arbitrator, how would you decide?

For the actual decision turn to page 228

DO-IT-YOURSELF EXPERTS Scherff (right) and Page design and assemble controls in modest, shop-like lab.

Make-'em-Yourself Controls

Takes only two experts to dream up and build electronic controls for precision jobs at Associated Spring. The payoff? Lower cost, higher quality, new business.

BUILD YOUR OWN electronic controls? Can be done. Look at Associated Spring Corporation. For 10 years its Bristol (Conn.) Divisions have been designing and building their own electronic devices for controlling production equipment and inspecting mechanical precision springs and stampings. Today's total: About 120 devices on production jobs. All are made in the company's plants from standard parts and components that are commercially available.

"It really pays off," says Charles Stofko, factory manager. "But I wouldn't attempt to put a dollar sign on equipment that has solved so many production problems, reduced costs, improved quality—and even helped us get business we couldn't have handled otherwise."

Two Bristol Divisions men — Louis Scherff, research engineer, and Gordon Page, his associate — do all the research, design, development, building, installation, and maintenance of electronic equipment. *Their main field:* problems that can't be solved with conventional equipment. *Their main emphasis:* simplicity, plus conservative design to insure trouble-free operation.

The electronics department — Scherff and Page — reports directly to the factory manager. This eliminates red tape, speeds development of equipment. The department recently moved into another area of the shop. There it can grow to more than double its former size.

Why make your own?—Best answer is that you can't buy most of the equipment. And much of it is so special that the cost of having

somebody else develop it would be prohibitive. But Associated Spring finds many other benefits in its do-it-yourself program. For example:

. . . Controls are tailor-made. Electronics experts at the plant are in the best position to develop the most practical control for the job. They understand spring-making — and the motions, times, and methods used by production operators. And they can adapt controls to workers and the patterns they're used to.

. . . Know-how is right at hand. And it pays off. Production men couldn't hope to teach an outside electronics builder a great deal about the spring-making business. And an outside firm wouldn't have the same vantage point from which to view equipment design.

. . . Production secrets are safe — for a while, at least — from competitors. It takes a lot of ingenuity to develop electronic control equipment. That's why the company doesn't always want competitors to get wind of solutions to certain production problems.

Shirtsleeves research — Developing electronics equipment for production jobs demands close coordination with manufacturing. For this reason, Associated Spring's concept of shirtsleeves research is especially suitable. Scherff and Page have their lab right in the shop — with no fuss or formality between them and regular production workers. This way, they know what's going on in manufacturing, have a close relationship with manufacturing people, are aware of problems — and their solutions. Result: Manufacturing depends on them, works well with them, has high respect for their ability.

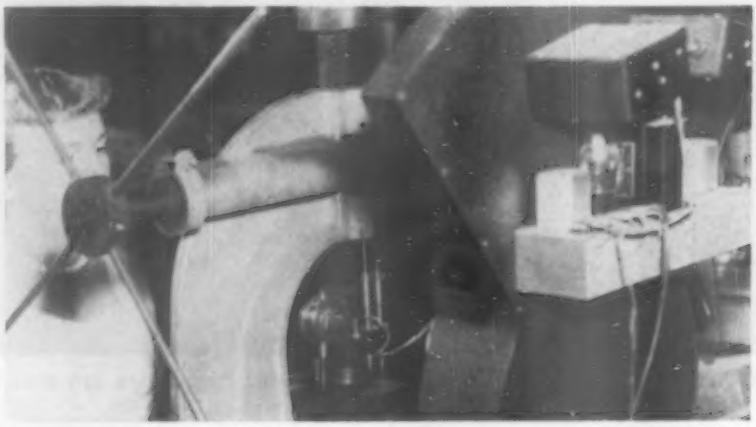
This close-to-the job arrangement makes it easy to study the functional use of equipment and adapt it to the operator. Often Scherff and Page bring a worker into the lab to solve problems while they're developing equipment. They do their debugging right there. Time for debugging varies, but it's rarely more than a few weeks. When equipment is installed, it usually works right from the start—and continues to work right.

Design objectives—Secret behind Associated Spring's success with electronics is design objectives. Primary goals are simplicity and reliability. Extras are eliminated to make equipment inexpensive and foolproof. For example, if one control knob can do the job, why have more? Fact is, it's easy to develop a complex electronic device to do a job. But it takes real imagination to make a simple one.

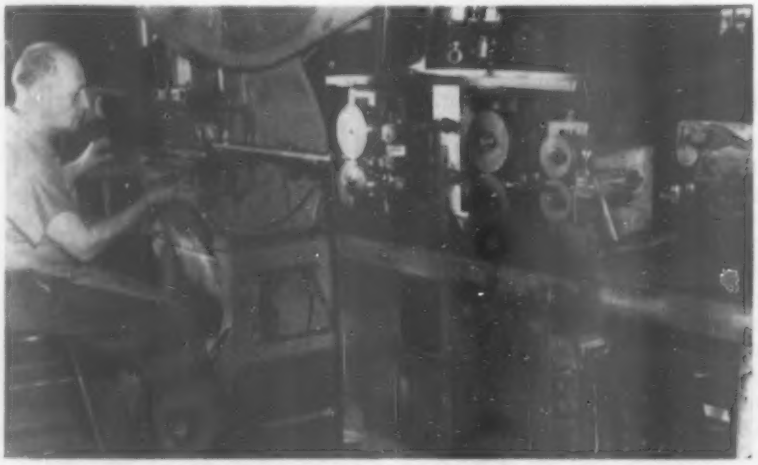
Associated Spring spares no cost to provide reliable parts and components. And Scherff and Page always over-design on small components. If design calls for a 5-watt resistor, they use a 20-watt to be on safe side. Results—reduced maintenance, longer life — more than pay for slight extra cost.

Another of their major targets is safety. They're ultra-careful to protect operators from any possible danger. This often requires isolating circuits, low-voltage operating circuits that are stepped up inside the control box. Scherff also knows there are some things he just can't put out in the shop — such as a $10,000 oscillator. He always tries to use the simplest method — recommends that if you can get the same results by any other method, don't use electronics. (For a major report on what you need to know

Six Jobs for Home-Made Controls



1 **TESTING** for height and tension—Accurate gage stops would be pitted by ordinary electric currents. So tubes and relays are used here to control indicating lights in the dial of this precision machine. Two colored lights are connected to show when critical dimensions meet tolerances.



4 **CUTTING AND PUNCHING** strip—Here a home-made and a commercial control work together. Large Potter digital counter (lower right) counts impulses from slotted wheel turning with strip rollers. When right amount passes, machine punches and cuts. Small controller (top center) supplies time delays.

about electronics, see FACTORY, September 1953, page 118.)

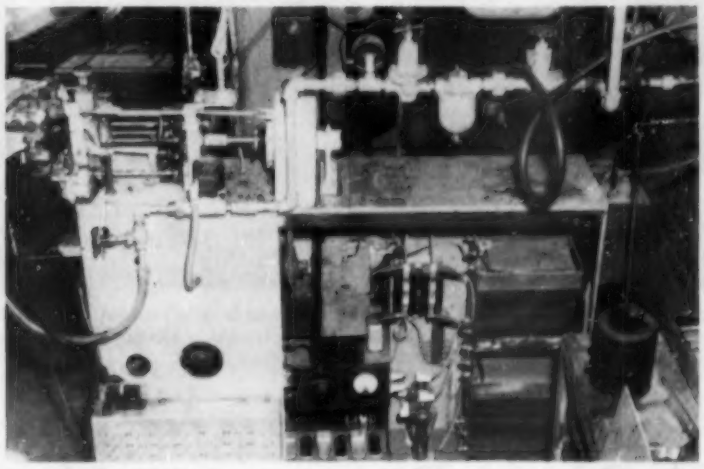
Standard equipment, too — The company also buys standard electronic equipment — when it's available and can solve the problem at hand. For example, standard temperature controllers from companies like Leeds & Northrup, Foxboro, and Brown Instrument. These are usually installed by Associated Spring's regular maintenance department. In addition to the two-man electronics department, the Bristol Divisions (made up of Wallace Barnes Company, Dunbar Bros. Company, F. N. Manross & Sons) have four instrument men who can maintain and install any standard electronic equipment. They also have 10 other electricians out of 40 men in the maintenance department.

Maintaining home-made equipment—Almost no problem here. But with the electronics department so handy, any trouble that develops is a cinch. Most of the maintenance consists of improving design and making adjustments. Only Scherff and Page service the special controls. But the company's instrument maintenance men service standard controls bought outside.

Effort that goes into design pays off in reliable, trouble-free operation. For example, Associated Spring has never had a tube burn out in production except after normal life expectancy has run out.

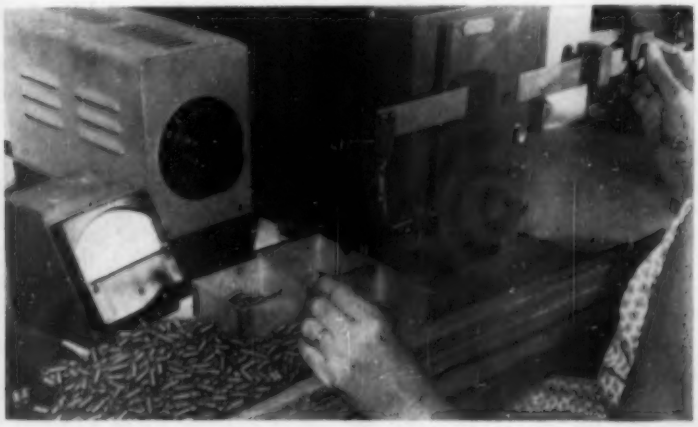
Although some controls have as many as 30 tubes, tubes are usually kept to a minimum. The company's 120 electronic devices contain a total of less than 600 tubes. In some controls semi-conductors, like germanium diodes, are used to eliminate waiting for tube warm-up. And Scherff purposely limits himself to 30 tube types. That way, stocking and replacement are simple. Most tubes and other components are kept in the stockroom. Those used most often are kept right in the electronics department.

2 **DRIVING** revolving oven—this maintains critical revolving speed to heat-treat fine hair springs. If torque changes or wheel sticks, buzzer buzzes, lights flash.



3 **MEASURING** and cutting—Granddaddy of all electronic controls at Associated Spring is this spring coiler that was made over 10 years ago. It measures and cuts off long springs to a few thousandths of an inch. Switches in box at lower right of photo are set to control length.

5 **ASSEMBLING** hubs to hair springs—Crimping pressure of solenoid is controlled by d-c stored in these capacitors. Single knob gives right pressure for hub size.



6 **MEASURING** spring tension—Deflection of springs as weight is changed is amplified electronically and read from a meter. Photocells do sensing, thus eliminate strain imposed by former rough mechanical system of measuring tension. Under old system, a pointer measured strain.

BLIND EMPLOYEES have high production records at Thermoid. And need no special considerations. Here Joseph Piechowski, a top producer in the plant for 12 years, is drilling rivet holes in brake linings.

SHOW INITIATIVE, TOO. Above, Piechowski is outlining to A. K. Runkle, factory manager, an idea for increasing production. His proposal was

A New Report on Hiring the Blind

From a plant manager who's had blind workers on the payroll for over 12 years. Here, from his long practical experience, is his hard-headed appraisal.

LIKE MOST plant men, you have probably heard and read a lot about hiring the blind. You may have been approached by your state commission or some other group. You may even have seen blind employees like Joseph Piechowski (above) at work in a plant. And while impressed, you found yourself filled with nagging worries that blind employees would require special treatment or facilities. You worried about safety, about how other workers would react. A. K. Runkle, factory manager of the Friction Division, Thermoid Company, Trenton, N. J., had those same worries—for a while.

But he has no such worries today. Runkle has had blind employees in his plant for over 12 years now. He's had a total of nine, five of whom are still in the shop. He found there were five easy rules for getting along with blind or otherwise handicapped employees:

. . . *Avoid special considerations.* Give sightless workers neither more nor less supervision than others.

. . . *Don't treat their jobs as a gratuity.* A blind worker won't expect special privileges, but he wants what's coming to him as a regular employee. He'll watch the standard earnings as closely as the next person. And he'll let you know if he thinks rates or allowances are out of line.

. . . *Make them earn their way.* Blind employees have to prove themselves on the job just the same as any other employee does.

. . . *Use the same judgment when hiring* a blind person that you would in hiring a sighted one. Hire only those well adjusted to their handi-

accepted by the company and successfully put to work. And it won the blind worker a $10 suggestion award.

caps. Don't confuse the issue with pity, no matter how genuine.

. . . *Remember that blind people* are normal in more ways than you might think. A blind worker who can "beat the rate" is just as likely as a sighted one to stir up jealousies among co-workers.

STARTED DURING WAR

Ed Runkle was foreman on the drill press job when Thermoid first hired blind operators in 1943. At the peak of the labor shortage, the company was approached by the New Jersey Commission for the Blind. A placement director, blind himself, studied the twin-spindle drill press job (there are 10 press jobs in this 450-man shop), then taught it to two blind men. Since then, the senior blind employee has broken in new blind people as they're hired.

While Ed was sympathetic to the project, he wasn't optimistic at first. But after the adjustment period, which he believes is harder for the sighted person than for the blind one, he came to the conclusion that the way to get along with the blind is to treat them like other employees.

The blind are "normal"—Runkle is most impressed by the fact that the blind person is so similar to the others in his work group. For instance, there has been little difference in the time they take to learn a job. None of the blind has a seeing-eye dog. Each comes to work with other employees or alone by bus. They go unattended to the drinking fountain and wash rooms. Within their job classification they can handle every job well and share assignments on an impartial rotation, work at any of 10 different machine locations. And need no special safety devices.

He's surprised their personal habits are so normal. They bowl, play golf, operate and erect "ham" radio stations, join in employee recreation. Contrary to what he expected, he finds they don't stay together in a clique. They associate freely with sighted workers, find their own friends among them.

Thermoid's five blind workers range in age from 30 to 43 years, service from 1 to 12 years. Only one has ever quit—to take a job as a placement supervisor with a Blind Association. One young man was let go because of his inability to adjust himself to factory life. Two women were tried out and also dropped, because of in-plant problems for which they were in no way responsible. Blind workers have taken the occasional layoff for lack of work, according to seniority, along with the rest of the plant.

Upgrading—This is the biggest problem with blind workers and the one thing that really bothers Runkle. Several of the blind workers feel certain they can run more complicated equipment—a multiple-spindle press, for instance. There, they'd have more interesting work, earn more money. Runkle feels that they could learn to do it, too. But he's worried that expensive equipment might be damaged during the break-in period, or a serious accident might happen before proper safeguards could be designed.

To date, he's decided to restrict the blind to employment on twin-spindle drill presses. (The New York Lighthouse for the Blind says one of its big problems is to overcome this natural and understandable hesitancy among employees to promote the blind to more complex jobs. And it claims that blind people rarely are given an opportunity to work anywhere near the practical limits of their abilities.)

Thermoid says that in its plant the ideal job for the blind person is one that is permanent, where workflow is steady, set-ups are provided by specialists, and raw and finished stocks are moved to and from workplace by material handlers. These are the conditions on the drill press job for both sighted and sightless workers.

The blind produce well—Originally Runkle would have been pleased just to find that blind workers could do the job passably well. But this is what he's found to be true of blind empolyees:

. . . *Their production rate is high and steady.* Averages from 115 to 125% with little fluctuation.

. . . *They have few accidents.* The safety record for blind workers is almost perfect—only one cut finger over a 12-year period.

. . . *They're tops in attendance and punctuality.* As Runkle says, "It's a big help in scheduling. You know they're going to be here and how much they'll produce."

. . . *They're easy to get along with.* T. Holden, the personnel manager, says, "By and large they're the most uncomplaining group we have."

COMPANY ATTITUDE

Hiring the blind gets approval and encouragement from Thermoid's top brass, including T. J. Ellis, Production vice-president. But it's not a matter of policy. Employment of the blind is up to the personnel manager and the factory division manager. It's their prerogative. Proof that Thermoid treats its program in a matter-of-fact way: When FACTORY's editors asked for the total of handicapped workers in the plant, it wasn't at anyone's fingertips. Said Personnel Manager Holden, "We keep no special records. When it comes to hiring handicapped workers, we screen them, assign them, and then forget there's anything different about them."

FACTORY | HUMAN RELATIONS

By LESTER R. BITTEL, Industrial Management Editor, FACTORY

Breaking the Coffee Break

Too much time on that coffee break? Jack & Heintz, Inc. (Bedford, Ohio) dumped that problem in the laps of its industrial engineers. The IE's got out a stopwatch, came up with a solution.

At J & H coffee is free on the company. It's doled out twice per shift. Employees queue up, help themselves from urns mounted on carts. Carts are towed to stations by electric truck. Time studies showed employees took up to 12 minutes a break.

Reason: They had to stand in line too long.

Solution: Carts were rebuilt to carry two urns. Now two lines, instead of one, can be formed at each cart. Number of coffee stations has been increased. Instead of towing single carts, truck tows them in tandem, drops them off at different stations rather than make round trip for each station.

Result: Coffee time per worker is now 7 minutes.

Have Ideas, Will Travel

Awarding the top suggester of the year a week's vacation at a resort hotel isn't exactly a novel idea. But sparking suggestions by sending each employee a travel folder for the particular resort seems a mighty effective way of helping to turn his (or her) yearnings into earnings. That's the thinking behind one "Bermuda Bound in 1956" suggestion contest.

Block Those Rumors

Got a problem at your plant that you can't hide from the public? Something that passers-by can hear and worry about? Perhaps a direct answer is in order. Like the little pamphlet Esso Standard Oil Company distributes called "Refinery Safety Flares: What and Why."

People who see flares flaming from the tall gas-relief stacks associate this with an air pollution problem. Esso's booklet not only gives with the facts. It also lets the company tell about its progress in combating air and stream contamination.

If you'd like to know more about the Esso way with a rumor, write to the public relations department at 15 West 51st St., NYC.

Now—Blind Inspectors

Score another use for blind workers in industry. Now they can work as inspectors in precision gaging —measuring accurately to 0.0002 inch. It's done by hooking up a sound amplifier to an electronic gage.

Frank Dedek, methods research supervisor at Burroughs Corporation, Detroit, designed the gadget. Got the idea after he developed an automatic assembly line that displaced two blind girls.

Operation is simple: The worker inserts parts into a measuring anvil; if the part is undersized, a low-pitched tone sounds in a tiny ear microphone worn by the worker. An oversized part registers as a high-pitched tone. Parts meeting specifications produce no sound at all.

Engineers can see no reason why the same principle can't be extended to multiple gaging, using notes of the standard musical scale as indicators. And they say that by using Dedek's method most industrial gages can easily be adapted for use by the blind at relatively low cost.

Burroughs is not in the gage business, but will be happy to provide blueprints and any other pertinent information to responsible groups who want to help the blind in industry.

Even Editors Are Human

When it comes to hiring editors for your employee magazine, you get what you pay for. The record proves it, points out The Robert D. Breth Organization, communications consultants, Philadelphia. According to a survey made in 1951 only 7% of all existing editors of company publications had held their current jobs for 10 years; 74% had held them for less than 5 years. Such an indication of turnover among ordinary industrial employees would be considered catastrophic.

Solution according to Breth: Good editors who are paid a decent income will stay in the editing field and with the same company — provided recognition, job satisfaction, job security are present.

Training Programs for Free

If you've got a skills training problem at your plant, don't overlook one of the easiest ways to get a training program underway. Take advantage of the services available from the manufacturer or distributor of the machines and materials you use.

Upon these services you can build a 3-point program practically for free:

1. *Show motion pictures, filmstrips, and slide films.* For listings try Bulletin 1951, No. 21, Federal Security Agency, Office of Education — "3434 U. S. Government Films," 70¢ at the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.; "Industrial Film Bibliography," $2 at the National Metal Trades Association, 122 South Michigan Avenue, Chicago 3, Ill.; "Index of Training Films," $2 at Business Screen Magazine, Inc., 150 E. Superior St., Chicago. And keep posted with the latest films by reading FACTORY's New Films.

2. *Distribute instruction manuals and pamphlets.* Check your manufacturer or his distributor. And be sure to read FACTORY's Catalog News and New Books sections which list helpful booklets.

A good illustration of what you can expect is Gould-National's "Battery Users' Training Manual." It follows a growing trend. It's designed, not as an individual instruction manual, but as a model around which a training program can be built. Material is organized so that it breaks up into 10 logical segments—can be presented in five training sessions. To get a copy of the manual, write Gould-National Batteries, Inc., Trenton 7, N.J.

3. *Utilize manufacturers' training services.* Many companies provide personalized or group training for your operators and maintenance workers either at your plant or at theirs. This is like adding an expert to your training staff. And gives workers the feeling that they are getting something straight from the horse's mouth.

Before latching on to any of these three services, it's wise to recognize why a vendor offers them — and then plan to adjust your usage to get the best out of them.

A vendor may simply want to be sure that his product is used to the best advantage in your plant, or he may seek the acceptability of his product among the workers who use it, or he may consider such training service an effective selling device. In any event, in his movies, his manuals, and his training spiel, there may be a little or a lot of the sales pitch. You'll have to provide the necessary guidance to your employees, to enable them to separate the kernels of knowledge from the sales chaff.

The Elephant That Blushed

Remember when Bill Terry, New York Giant manager, asked, "Is Brooklyn still in the league?" And then lived to eat those words as the aroused Dodgers knocked the Giants out of the pennant?

Well, here's the case of an industrial plant that turned a derogatory phrase into a profit-making slogan.

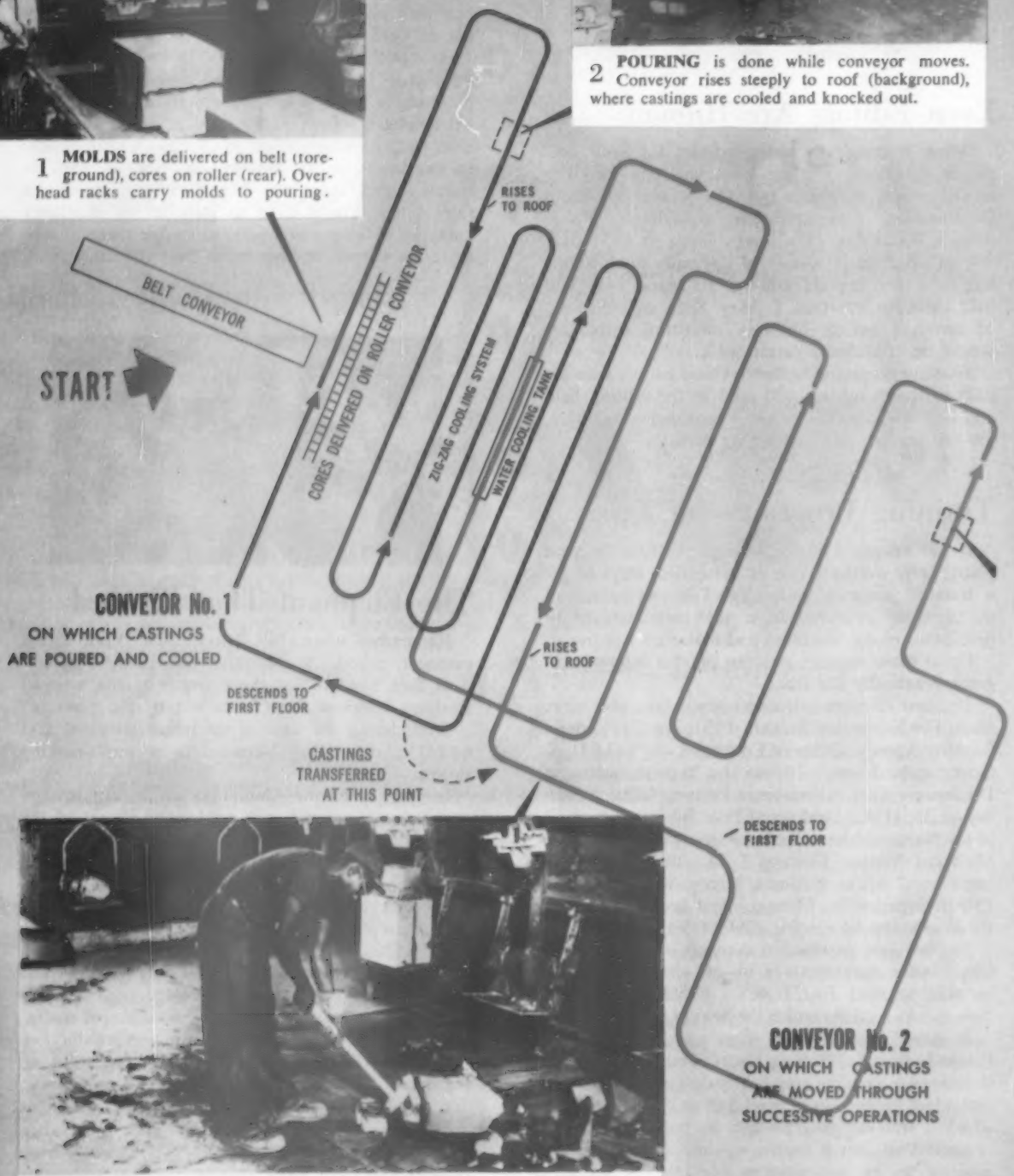
In 1954 when the Aluminum Division of Bridgeport Brass Company took over management of the mammoth U.S. Airforce plant at Adrian, Mich., the local press dubbed the plant a "white elephant." Capitalizing on this label, H. W. Steinkraus, Bridgeport's president, promised employees a "pink elephant" party when the plant got into the black.

A "white elephant" campaign was begun to bring the plant out of the red. Competition was sparked by interdepartmental cost-reducing contests. Every month each department received a statement outlining its contribution and relationship to production.

In June, 1955, 17 months after the contest began, plant operations broke into the black. To celebrate, 700 plant employees attended a gala party—all as company guests. Climax of the affair was when members of Bridgeport's White Elephant Club painted a life-size, papier-mache elephant a blushing pink. The elephant now stands on the plant lawn, jubilantly blowing water through his trunk.

1 **MOLDS** are delivered on belt (foreground), cores on roller (rear). Overhead racks carry molds to pouring.

2 **POURING** is done while conveyor moves. Conveyor rises steeply to roof (background), where castings are cooled and knocked out.



3 **KNOCKOUT** room is on roof. Castings are transferred to Conveyor 2 (background) lowered to first floor for processing. Broken molds and salvaged metal drop down chutes.

Need More Floor Space? Look Up!

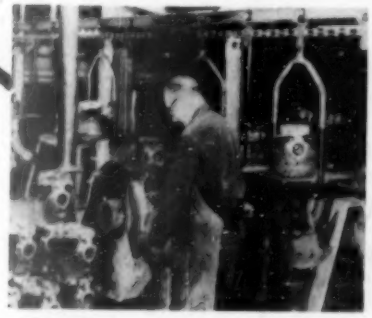
Up under the ceiling — and out on the roof. That's where Oberdorfer found desperately needed room. Now two new trolley conveyors are paying off seven ways.

CAPACITY UP 300% — from 25,000 to 100,000 pounds of castings per day. But no increase in floor space, no sacrifice in production elsewhere in the plant. That's the happy story at Oberdorfer Foundries (Syracuse), largest independent aluminum foundry in the nation. Oberdorfer attributes it all to a pair of overhead trolley conveyors (diagram and photos, opposite), plus overhead sand-handling.

Added gains? Take these six, for example:

. . . *Higher productivity.* Formerly, 120 men processed 500 cylinder heads per 8-hour day. Today's schedule: 94½ men, 1000 units. Productivity up from 4.16 to 10.58 units.

. . . *More flexibility.* Standard-type conveyors make up the system, can be stretched or shortened to meet any schedule, produce almost any type of casting.



PROCESSING is done on first floor. Here, as elsewhere in foundry, conveyor delivers work at convenient height.

. . . *Higher speed.* For one period of twenty 16-hour days, 1900 castings per day (1600 is normal) with only eight men pouring.

. . . *Lower scrap losses.* Workers used to reach for castings, sometimes dropped them. Result: Bent fins, which often broke off when workers tried to straighten them.

. . . *Less man-handling.* Molds and castings ride along on conveyors, ease the handling load on workers.

. . . *Self-liquidation.* The new system paid for itself within a year.

Problem—Oberdorfer had to have a 300% increase in capacity of its aluminum cylinder-head foundry. More floor space seemed unavoidable. But new floor space would be costly and slow to build and construction would mean delays in production. What's more, added floor space would mean carrying the metal farther—less production per dollar of in-plant transportation. Finally, production of more units would mean even more heat, smoke, and fumes from molds—and that situation was bad enough already.

Solution—Oberdorfer looked up, saw an unused ceiling as big as the floor. Called in an engineer from Lamson Corporation (Syracuse) to talk about overhead trolley conveyors. Together they hit on a two-conveyor system — one to handle molds; the other, castings.

CONVEYOR TEAM

Conveyor No. 1 — It's a 4-in. mold-handling unit. It begins at the core ovens. It's fed by a Lamson belt conveyor (which Oberdorfer already owned) on which dry sand molds have been built up, as on an assembly line. Molds are transferred (photo 1) from the belt to shelf-type racks that hang at bench height (30 inches from the floor) from Conveyor No. 1. Pouring-cup cores are cemented or glued to the top of the molds as they move along to the pouring zone.

At the pouring floor the conveyor drops down so that molds pass the pourers at a height of 15 inches above the floor—ideal for pouring (photo 2). Conveyor speed can be adjusted from 5 to 15 fpm. to accommodate different casting schedules and various sizes of castings. Pourers can start and stop the conveyor but cannot change speed setting. The conveyor carries the molds past (and parallel to) four reverberatory furnaces and eight holding pots, the latter arranged in a line in front of the furnaces. That way, molds are always in the same position relative to pots, regardless of which pot is being worked.

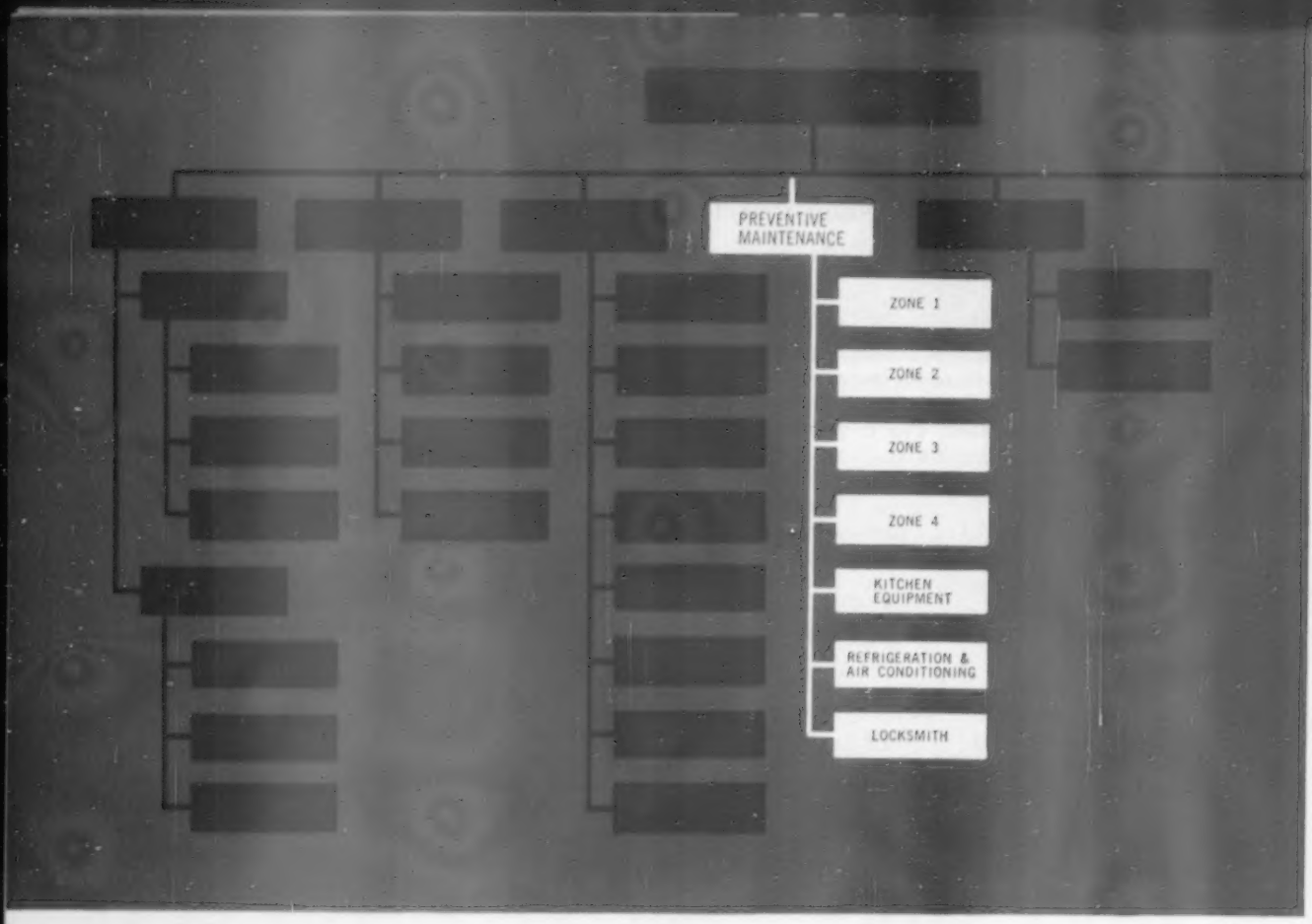
After the conveyor has carried molds past the pouring floor, it ascends steeply to the roof of the building, where a zigzag track (diagram) provides cooling time. Fast rise to the roof right after pouring eliminates the problem of smoke, gas, and fumes, leaves working conditions on the pouring floor as pleasant as in any other department of the plant. Oberdorfer built a new roof over the conveyor to protect the molds from weather.

The conveyor, still on the roof, next carries cooled molds to a knockout room (photo 3). Broken molds are dropped into a chute that carries them to a crusher on the first floor. Risers are removed, dropped into another chute, collected in a tote box on the first floor. The conveyor descends to the first floor, starts the cycle again.

Conveyor No. 2—This is a 3-in. unit. It starts on the roof. Castings are transferred to it in the knockout room. It drops steeply to first floor where, at two stations across room from each other, chills are removed and gates are sawed off the castings (photo 4). Distance between the stations provides cooling time. But to insure adequate cooling, castings are immersed for about two minutes in a 15-ft.-long water tank installed beneath conveyor system (diagram).

Why overhead trolleys? — They can be designed to operate at almost any height above floor level (for example, 30 inches for building up molds, 15 inches for pouring). They provide steep lift, thus raise castings out of way of floor workers fast and speed dissipation of smoke and fumes. They put roof space to good use. And make it possible to use gravity flow for knocked-down molds and salvaged metal.

How long to install? At Oberdorfer, only 10 weeks — with no interruption to production.



Beating the Breakdown Rap

Want more from your plant and services? This Air Force plan will trap your troubles before they start, save money and worry in any plant, big or not so big.

LOOK AT THE CHART above. It shows the organization of maintenance operations at Moody Air Force Base, Valdosta, Ga. White blocks show the role—and the stature—of preventive maintenance (PM) in Moody's big maintenance program.

PM is the newest, most important addition to installations maintenance at Moody. What's more, it's the big key to efficiency and cost savings (taxpayers please note). Fact is, it has done such a good job at Moody that the Air Force is now setting up PM as an individual branch within its maintenance departments on a world-wide basis.

Air Force PM was developed in the Air Training Command, was tested at 29 bases—including Moody, where it was coordinated by Headquarters, USAF, with the Moody Installations Engineer Management Tests.

For plant operating men, first thing to know about the Moody PM plan is that you don't need a plant as big as the Air Force—or as big as Moody—to use PM and profit by it. PM is for everybody. And you'll find, when you get going with it, that it will pay off for you same as it does for Moody.

Here's what it has done at Moody:

. . . *Productivity* of entire maintenance department has risen 50%.

. . . *Effectiveness* of stock supply has increased 10-fold.

. . . *Nuisance calls* are down from 1200 to 450 in a six-month period.

. . . *Outside contractors* are being called in less often.

. . . *Breakdowns* come less often.

. . . *Maintenance costs* are under control.

. . . *Maintenance data* and records are being built up.

. . . *Maintenance men* work on specific assignments (by zone) and with clear responsibilities.

. . . *Service calls* are now completed 12 times faster.

By FRANK W. MICHAL
Electrical Editor, FACTORY

. . . *Employees* are happy—proud of their individual branches and eager to compete among themselves.

Find it and fix it—To experiment with a new pattern for facilities (buildings and plant services) the Air Force picked Moody. Not because Moody was behind the times. But because Base Commander Robert F. Worden was doing a good job. That was the challenge—to improve a plan that was already good. And because Moody is a typical Air Force base—has permanent and semi-permanent facilities, a normal schedule of major and minor rearrangements, and new construction.

At the time Moody—like a lot of industrial plants—wasn't geared up for PM. Effective PM was the one big thing the Air Force was looking for. *Aims:* To cut the costs of major repairs and replacement and keep facilities at an operational peak. Also to go beyond inspection and into detection and correction. "Find it and fix it," the Air Force slogan goes.

But you can't create a good PM program to stand alone. It has to be meshed with regular maintenance and plant engineering. So the Air Force surveyed its entire maintenance program to spot weaknesses and find clues for an effective PM program. The survey covered seven areas: organization, flow and control of work, supplies, transportation, cost procedures, property accounting, and funds.

That way the Air Force came up with its PM program. Today it's working fine. With little modification it will fit almost any Air Force base — or almost any plant, including yours. Here's how it works:

Separate PM branch—It's the big, important change—a separate branch at comparable level with other maintenance branches, flexible enough to carry out PM on different types of structures and facilities. Why? The Air Force puts it this way: "To be successful, a preventive program must be aggressive and continuous. Failure to maintain these objectives, by diverting PM personnel from assigned duties for improvement-type projects, will lead to major deterioration of facilities." And PM personnel must be independent of complaint or nuisance calls.

The branch is headed by a PM superintendent. His duties are to:

. . . *Make general surveys* of facilities and equipment.

. . . *Investigate major complaints* arising from lack of maintenance.

. . . *Assure corrective action* by appropriate maintenance personnel.

. . . *Anticipate supply needs* and direct zone PM supervisors in procurement of necessary supplies and return of surplus items.

. . . *Initiate requests* for repairs beyond the scope of PM.

. . . *Stay abreast* of general building conditions.

. . . *Record anticipated repairs,* rehabilitations, alterations.

. . . *Maintain close liaison* with the installations engineer regarding need for maintenance projects.

Administrative and supply clerks, reporting to the PM superintendent, help prepare and maintain the record file of (1) all zone PM cards and books and (2) charts or pin maps showing location of PM crews. They help zone supervisors in procuring supplies not available through normal channels. And they maintain liaison with the complaint clerk (in the work-order section of the management branch) and initiate work requests and follow-up on work beyond the scope of the PM program.

Clear limits—PM is organized to perform only at a Constant Standard of Maintenance (CSM). CSM is the efficient application of manpower and funds to prevent a facility from deteriorating in value and usability (other than from obsolescence). The life of a facility maintained at its CSM can be indefinite. Application of CSM does not permit recovery of a facility from a state of neglect and deterioration. It merely holds the facility "in status quo." Maintenance that goes beyond CSM falls within the scope of major repairs and minor construction programs and is accomplished by forces other than PM personnel. When work beyond CSM is needed, PM people use a form (next page) to pass the job along to the branch concerned.

Zone breakdown—A zone at Moody—or any other base—contains no fewer than 50 and no more than 200 buildings. Determining factor is that PM for each zone must make a complete coverage of buildings and facilities on a cycle of 90 days or less.

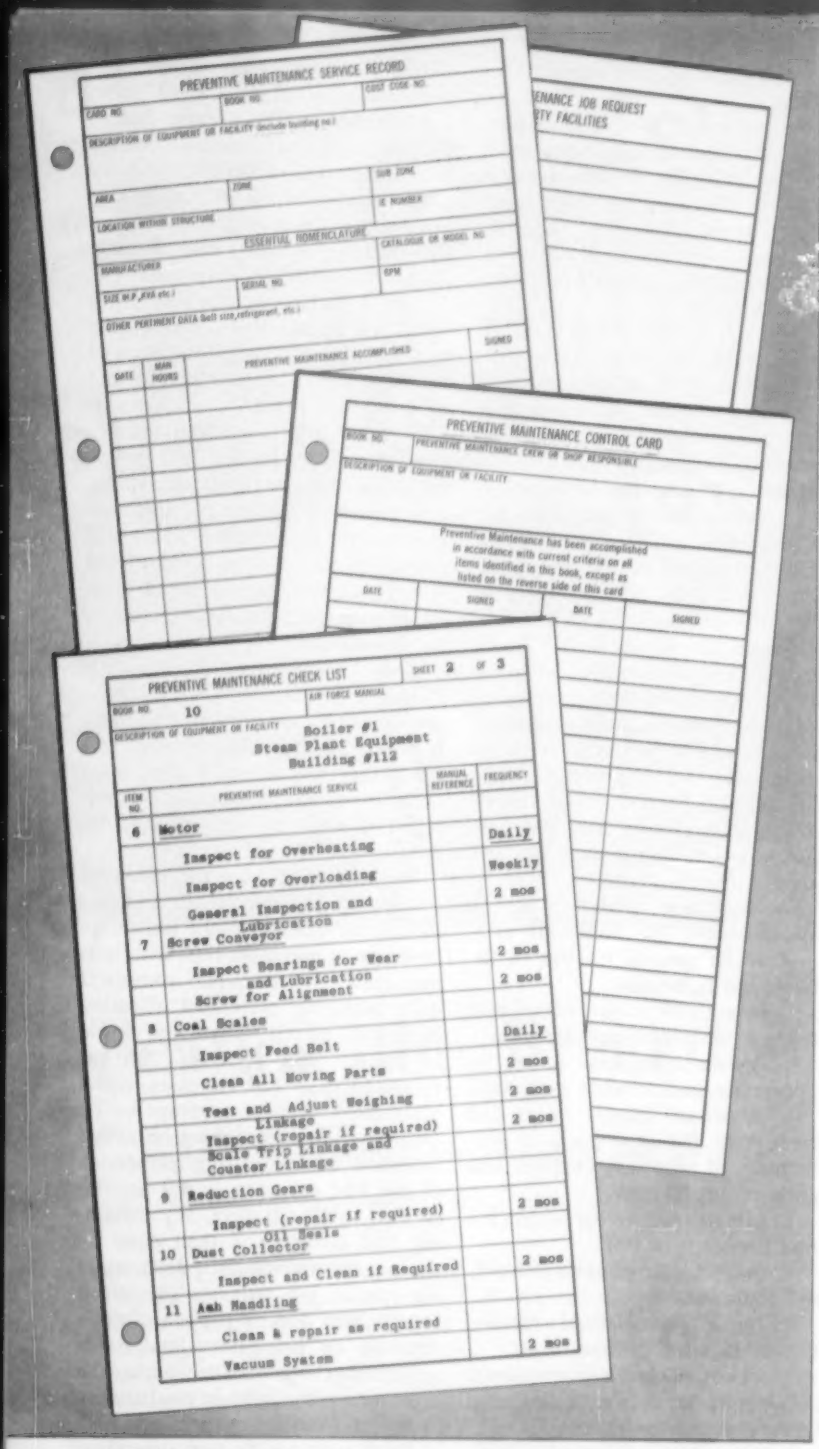
Why 90 days? It's the result of a study of past experience and historical records to assure maximum coverage in minimum time with normal crew. For example, complaint calls requiring individual attention begin to mount when the cycle is greater than 90 days. And as productivity of PM increases, crews accomplish broader coverage — by enlarging the zone, taking on added facilities, or decreasing personnel. If the PM coverage is not accomplished within 90 days, any remaining PM coverage is then done by the regular maintenance department on special job requests (described later). This doesn't happen often—because an immediate analysis is undertaken to determine whether the zone area is too large or productivity is not as high as it should be.

Each zone has its own supervisor —a working journeyman. Briefly, some of his duties are to . . .

. . . *Outline work* of crew members, providing (1) predetermined work schedules, including work to be accomplished; (2) proper check lists; and (3) instructions to insure balanced and constant work levels.

. . . *Maintain supplies* at proper working level.

Turn the page



THESE FOUR CARDS are key to control of preventive maintenance program at Moody Air Force Base. They ensure work is done properly, provide historical data.

BEATING THE BREAKDOWN RAP . . . *Begins on page 132*

. . . *Check quantity and quality* of work done, report good and poor work to the PM superintendent.

. . . *Insure* that all waste is removed, sites are cleared when jobs are completed, and surplus or salvage is returned to location.

. . . *Inform* PM superintendent of fire hazards, overloading, and repairs that require too much time or material for crews.

Zone crews—They include craftsmen-mechanics to cover carpentry, plumbing, electrical equipment, heating equipment (other than central heating plants), painting and glazing, roofing, etc. They are assigned by a specific skill only—not a combination of skills. The skill level for PM personnel is the same as that in the regular maintenance shops. That's because PM crews must perform on-the-spot repairs and servicing along with scheduled PM coverage.

Where type or amount of work per zone does not justify full-time craftsmen-mechanics, assignment is made on a combination of zones or on an entire installation basis. These include locksmith, food-service equipment mechanics, masons, sheet-metal workers, truss maintenance crews, and air-conditioning and refrigeration mechanics.

In the utilities plants and associated facilities (central heating; sewage pumping, treatment, and disposal; and water plants) PM is done by plant operators. But the plant supervisor is responsible to the PM superintendent for maintaining PM records. Also, the regular maintenance and repair branch is responsible for PM on paved and surfaced roads, airfield lighting, drainage, utility railroads, groups, and electrical transmission and distribution. The regular maintenance shop foreman, however, as is true of foremen in utilities plants, is also responsible to the PM superintendent for maintaining PM records.

EQUIPMENT FOR PM

Mobile trailers—They're used by zone crews to keep travel time to and from zone centers to a minimum. And separate mobile trailers are used by trades that work in each zone. Crews that work together, like painters and carpenters, share a single trailer. Specialist crews, such as refrigeration or electrical crews, each have their own trailer. These trailers — converted, obsolete bomb trailers — carry not only a complete set of tools but a supply of replacement parts to perform any on-the-spot repairs and service within the scope of PM.

Supplies—The zone supervisor is

responsible for ordering materials and supplies for his crew. Normally, he replenishes stocks every two weeks. A three-week level is maintained in PM trailers and work centers. Standby items, not required on a recurrent basis, are stocked only in limited quantities when a potential requirement exists. Supplies are drawn from central maintenance stores. If not available, they are obtained by purchase requisition.

Technical manuals—They're something most industrial plants don't have. But without specific "best-way" instruction, you're out on a limb in administering a PM program. The Air Force has put together a series of 20 manuals (Air Force Manual 85 series) that make the program click. The manuals cover the entire maintenance field. For example, Manual 85-12 covers heating plants and systems. Each manual covers frequency of inspection and breaks contents down to which components to inspect, how to perform repairs, and what to watch out for. Gives breakdown for each type of facility and structure.

PM record book—It's all that's used to carry out the PM program. Only one active copy is available. It's always in the zone trailer when not in use by the zone crew—always available for inspection by the PM superintendent. Each zone has at least one set in loose-leaf form, depending on number of workmen in the zone. The book contains four forms: PM checklist, PM service card, PM control card, and PM job-request card (opposite page).

Checklist—There's one for every type of equipment and facility. Under each piece of equipment are listed important parts that require inspection. There's one space for an item number. It's the same number that's assigned to the equipment and its parts in the manual. Checklist also has a brief description of PM service needed, page or paragraph from manual for reference, and frequency of coverage.

Inspection coverage is flexible. That is, inspections and corrections are not required on a specific date but on a time-interval basis. This allows a zone crew to carry out its program efficiently with minimum interference from inaccessibility of equipment. Besides, it keeps paperwork simple.

Items are listed in order of frequency of coverage. That is, daily items are listed first, followed by weekly, monthly, etc. Semi-annual and annual frequencies are noted in the frequency column, but the month or months during which PM service is to be performed are specified. Semi-annual and annual PM coverage is scheduled where possible to coincide with monthly and quarterly service.

Service record card—It's like a master machine record card. Only one set is maintained. Serves a dual purpose—keeps track of equipment locations and is an up-to-date record of PM performed on each facility and piece of equipment. Top portion of card is devoted to information, such as location, cost code, identification number, size, speed, horsepower, etc.

Bottom portion of card is filled out by the PM craftsman or by a supervisor each time inspection and correction is performed. Date of inspection and time used are recorded in the two left columns. If no more than routine maintenance is done, it is so stated in a "PM Accomplished" column. If any repairs are made beyond the scope of the checklist, they are noted in this column. If the extra work is something that should be done on a regular basis as part of PM it is added to the checklist by the zone supervisor.

If any repairs are required that would take more time than is allotted to the maintenance craftsman or zone crew, an entry is made in the same column, with a notation of the discrepancy. If required, a PM job request form (described below) will be filled out to cover the work. This work will be done by the regular maintenance department. The craftsman or the zone supervisor puts his initials in the signed column, located on the right side, showing that the necessary PM has been done.

The service cards are grouped by zone or even sub-zone and by type of equipment or facility, so as to assign PM craftsmen or zone crews to their work conveniently.

Whenever a service record card is filled, a new card is made out. The completed card is returned to the PM superintendent's office and the engineering branch for analysis. A continuation card may be attached to the old card in the loose-leaf binder, and entries may be continued without duplicating the description nomenclature. This is especially desirable in utility plants, where examinations and services are required every day.

Control card—As maintenance is completed on all items included in individual PM books, the responsible supervisor or craftsman-mechanic dates and initials the face of the PM control card. This form is located at the end of each section, or as the last card in each PM book. On the reverse side of this form, exceptions to normal maintenance are listed, as previously entered on individual PM service record. Whenever exceptions are listed, work-order initiation will be verified and such exceptions will be posted to a "suspense" file that is maintained in the PM superintendent's office. This suspense posting is used for follow-up pending work-order completion. If more space is required to record exceptions, additional control cards are used. When the control card is finally filled and action has been completed on all exceptions listed on the card, it is removed from the book and filed in the office of the PM superintendent.

Job request card—Upon finding that repairs or replacements to facilities or equipment (such as replacing a refrigeration compressor) are beyond the scope of the PM program, the zone supervisor or other designated PM personnel makes out a job request card, in duplicate, giving pertinent information as indicated on the card. The cards are then passed to the PM superintendent for approval. He forwards one card to the regular work control section (management branch). The work control section then processes a work order, marks the PM job request card with the appropriate work-order number and returns the PM job request card to the PM superintendent. The card is then returned to the person who submitted the original job request. The PM superintendent periodically examines the completed work-order files in the work control section, thus determines which of the outstanding PM job requests have been completed. He then makes the proper entries in the control card.

Retention of records—As PM service records and control cards are completed, they are retained in files for two years, then destroyed.

General training . . .

CLASSROOM FOR THEORY—Electrician Davis listens as theory instructor compares electrical and hydraulic systems.

. . . AND FOR PRACTICE—From shop instructor Davis learns to check a series-paralleled heater circuit.

plus specific instructions . . .

FOLLOW-UP training becomes more specific. Here Davis learns trade skill—how to detect a ground—from electrical foreman.

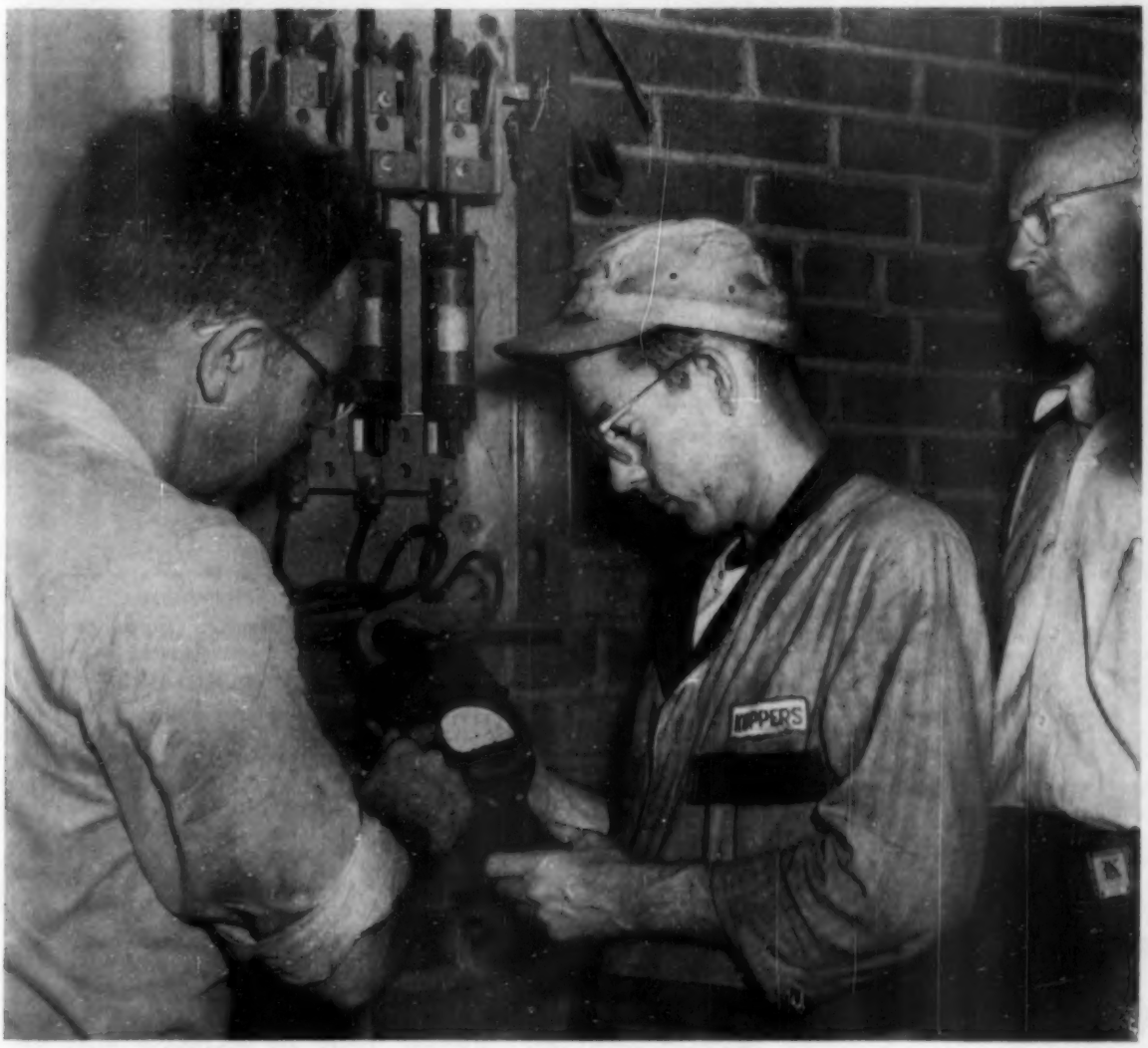
Updating Maintenance Skills — in

Today's needs too complex for your workers' skills? Then try an accelerated refresher. Koppers does—and gets results. Here's the story.

PROBLEM: Improve maintenance. You're the Koppers Company. You operate a polystyrene and standby butadiene plant at Kobuta, Pa. Of your 1200 employees, one out of five is a maintenance worker. Stills and process equipment must operate 24 hours a day, 7 days a week, year-round. Maintenance labor is one of your biggest operating expenses. Also your biggest headache. For years it's been good. Now, under the press of increasing competition, it must be better than good.

Solution: accelerated training. To make maintenance better than good, Koppers decided to train each maintenance worker all over again in fundamentals—just as if he were a new man. Actually, it was the first formal training most of them

means skill on the job



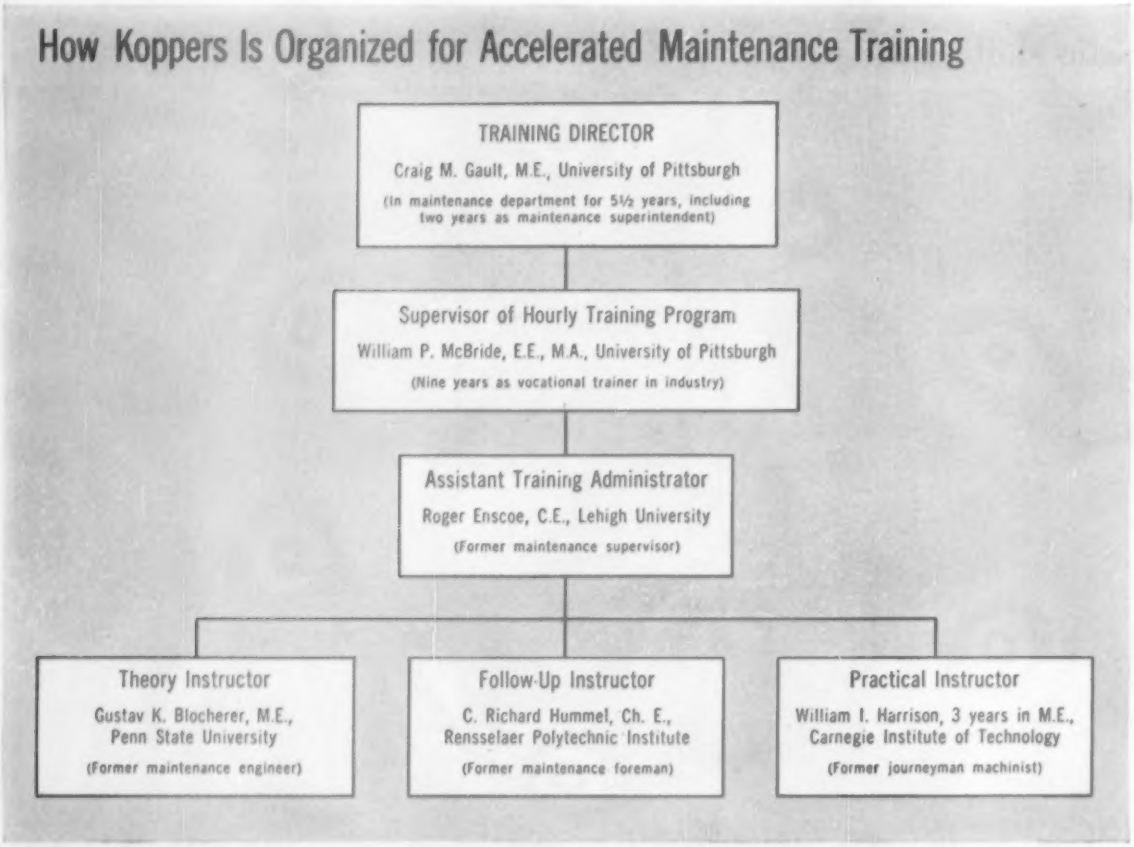
WITH SKILLS UPDATED in Koppers's Accelerated Training Course, Davis now passes his theory and practical know-how along to Helper Weber. Davis had five weeks in general course, 12 specialty lessons. Follow-up instructor checks on Davis.

8 Weeks' Time!

had ever had. The majority had come into the plant from a tight labor market during World War II. Learned on the job from the few real journeymen scattered through the department at that time. No apprentice training program was ever attempted.

Help from Holland—Koppers wanted the training done thoroughly and fast. To supplement its own training staff the company hired the Raadgevend Bureau — B. W. Berenschot, a firm of Dutch consulting engineers who have built up a reputation since the war for training maintenance and other skilled workers in a hurry. Their method, which they call Accelerated Training (AT), applies an intensified engineering analysis to training situations before developing instruction methods. Emphasis is on designing the training program to fit the work requirements, as determined by a systematic study of the job. It narrows down the general journeyman qualifications to those trade skills—and only those skills—required on a particular job in a specific plant. This simplifies and speeds up the training process. AT also incorporates proper job methods in the training course, together with a built-in recognition of environments—attitudes, incentives, supervision, organization, employee relationships—that surround each occupation.

Turn the page


How Koppers Is Organized for Accelerated Maintenance Training
TRAINING DIRECTOR
Craig M. Gault, M.E., University of Pittsburgh
(In maintenance department for 5½ years, including two years as maintenance superintendent)
Supervisor of Hourly Training Program
William P. McBride, E.E., M.A., University of Pittsburgh
(Nine years as vocational trainer in industry)
Assistant Training Administrator
Roger Enscoe, C.E., Lehigh University
(Former maintenance supervisor)
Theory Instructor
Gustav K. Blocherer, M.E., Penn State University
(Former maintenance engineer)
Follow-Up Instructor
C. Richard Hummel, Ch. E., Rensselaer Polytechnic Institute
(Former maintenance foreman)
Practical Instructor
William I. Harrison, 3 years in M.E., Carnegie Institute of Technology
(Former journeyman machinist)

ORGANIZATION CHART for the accelerated training program shows how theory, classroom practice, and follow-up all fall into place. It takes all the instructors above to train 250 men. Program director reports to plant manager.

UPDATING MAINTENANCE SKILLS . . . *Begins on page 136*

Why accelerated training makes good sense

"This is lend-lease in reverse—AT is just another word for Job Instruction Training," say the critics of the Dutch consultants.

"It puts the meat on the Training Within Industry programs. Ties Job Instruction, Job Methods, Job Relations together in one integrated pattern," say its proponents, which include the Methods Engineering Council of Pittsburgh; the TWI Foundation, Summit, N. J.; Urwick and Partners, London.

Jan Vershoor, Berenschot's American resident engineer, is perplexed by the confusion. He says, "AT makes such a terrible lot of common sense. Far from being a packaged program like the J's, it is an engineered solution to specific production and maintenance bottlenecks." It's common sense, too. Berenschot follows these nine logical steps:

1. Studies the organization and relationship between the supervisor and the worker.
2. Analyzes the job.
3. Selects best methods to perform the job in the way that is most effective.
4. Determines the personal requirements of the men to be trained to fill the job.
5. Designs training program, prepares instruction manuals.
6. Selects, trains instructors.
7. Trains the worker by an instructor, who is preferably his own foreman.
8. Follows-up with control and evaluation.
9. Provides for continuation of training.

Five key elements—Added to the logic of the approach are five essentials that make AT unique as well as successful:

. . . Only what job requires. Broad job descriptions won't tell you specifically what kind and degree of skills a man needs to perform a job as it's done in your plant. With AT you study actual performance of job, interview supervisors, engineers, hourly workers to determine what's needed. There's no need to train a pipefitter in lead burning, for instance (even though that's part of a journeyman's trade), if it's never done at your plant. Investigations show that supervisors tend to over-rate job requirements—insist they need an all-round man when the job is really narrow, specialized.

. . . Engineering approach. Unless your analyst understands engineering principles, he may waste the opportunity to incorporate better job methods in the instruction

manual, says Berenschot. The analyst should pick up details, often overlooked, such as who plans the job, how it's assigned, whether the foreman prepares sketches, how often he comes to supervise the worker, what sort of delays occur when the production department won't let the maintenance men get at the job, and how often the worker returns to the tool or stockroom for additional equipment. Here's where he spells out habits and approaches that have become just "knacks" to the experienced top performer, who recalls them not by objective thought but by "muscle memory." The engineer changes this muscle memory into facts more easily transferred by the instructor to the learner.

. . . Concentrated experience. Some of the toughest maintenance jobs come up only every so often. For instance, at Kobuta, certain condenser tubes might be cleaned only once every two years. Because of job assignments, a man could work in the department for several years without ever having to work on the condenser job. Result is you can end up with specialists within a single job classification. AT avoids this by listing all types of jobs that might arise within a certain skill class. Then provides experience on each particular job during the short training period. Sometimes it's done by mock-ups. But more often by anticipating the need—and setting aside jobs for trainees to work on.

. . . Attention to the supervisor. AT recognizes the critical importance of the supervisor to the job itself and to the man who is learning it. The foreman gets into the act in the study and planning stage. Receives related training he'll need to be a better supervisor and a better trainer (more of that later on). His thorough participation makes him naturally accept the final training responsibility, even though in most AT programs he will delegate instruction to a selected worker trained for the purpose.

. . . Planning for attitudes. A worker needs a positive attitude toward his job if he's to have a positive attitude toward his training. Therefore, in the planning stage, AT looks beyond the bare bones of the job. Puts emphasis on creating group training spirit and on what JIT calls "job relationships."

GENERAL COURSE

HOURS	SUBJECT
45	Blueprint reading
40	Shop mathematics
33	Basic operations (hammer, saw, file, etc.)
28	Physics (simple machine, electricity, heat, fluids)
14	Shop practice
5	Work planning
5	Plant equipment at Kobuta
10	Housekeeping, safety, care of tools
20	General lectures and test
200	TOTAL

SPECIAL FOR ELECTRICIANS (4-hour lessons)

1. Resistance measurements
2. Wheatstone bridge for grounds and resistances
3. Parallel resistance
4. Use of electrical instruments
5. Phasing and tagging ends of a Y-connected, 3-phase motor
6. Ground detector
7. Transformer tests
8. Open delta transformer connection
9. A-C controls, pushbutton operated
10. Pole climbing
11. First-aid procedures
12. Sling loading

DOUBLE-BARRELED program includes basic training for all the maintenance men, plus special courses that cover each trade (electricians, for example).

HOW "AT" WORKS

Koppers began its AT program with the pipefitter gang. Why? Because of its size. Six or more of its 40 tradesmen could be spared at the same time without crippling the operation. No other trade groups numbered more than 15 men.

The pipefitters' course was set up for eight weeks—total of 320 hours off the job at full pay. First to attend were six first-class mechanics, selected by seniority. They spent about 30% of their time on practical theory, the remainder on practice jobs. Experience was provided by a giant "jungle gym." It was built by the trainees for this purpose, had every type of connection, valve, and fitting encountered in the plant. This course was repeated for two more groups of pipefitters.

Lessons from the pilot course—Results were good, but Koppers' management learned something unexpected. Too much emphasis had been placed on hand skills. Actually, the men were more proficient manually than anyone had realized. They needed lots more training in elementary mathematics and other related theory. Also, the company realized that an extended, specialized course wouldn't be practicable in the trades where only one or two men could be spared at a time. That's when Koppers' local training staff took over the program and tailormade AT procedure to fit plant needs, set up a double-barreled program.

General training — First part of the double-barreled program is general. It's basic theory and practices —the common denominator for all trades.

Here's how the general course works. Eight men—usually each from a different trade classification —make up a class. They come off the job for five weeks of related training. Instruction is provided by two maintenance foremen—one an

expert on theory, the other well-grounded on the practical side of the job. About 60% of the time goes to instruction, the other 40% to problems and practice. Most of the 200 hours is spent in a 30x60-ft. classroom-workshop salvaged for $2800 from an old building.

Specialized training — This is specific. It provides specialized follow-up training for men in each of the 10 trade groups. With the general course, it compromises between the ideal and the practical.

Specialized training comes after a man has finished the general course. Guided by a manual of instruction prepared by the plant training staff, each trades foreman teaches his men the tricks of his trade. He does this both in and out of class. For instance, electricians receive 48 hours of specialized instruction, divided into 12 lessons. Boilermakers receive about 20 hours of specialized training; carpenters, 36; instrument men, 40; insulator men, 48; millwrights, 48; painters, 20; riggers, 20; welders, 40.

A lesson runs about four hours and is split 50-50 between classroom work and actual on-the-job instruction. The line foreman meets first in class with his men. He teaches the theory himself, but he may request assistance from the training staff. Then he takes his men out into the plant and has them practise tests and set-ups. Sometimes it's an actual fault they're looking for. Other times it's a mock-up problem.

Program control—Koppers' policy is that training is line management's responsibility. The staff organization's function is to prescribe training methods and specialized assistance. When there's any question whether to do a training job on a certain afternoon or postpone it until later to meet a plant emergency today, decision is up to the foreman. But Koppers also recognizes the tendency of some operating people to postpone training if someone doesn't keep after them.

To keep the pressure on until each man finishes his specialized course, Koppers assigns a maintenance foreman as a full-time follow-up supervisor. He acts as a combination pusher and truant officer. Keeps after the line foremen to see that specialized training is completed for each man and that what's learned in the class is applied on the job. Three reports help him on this:

. . . *Performance checksheet* to rate how the graduate does his job.

. . . *Training checksheet* to evaluate the line foremen as trainers.

. . . *Training record* to trace training progress against schedules.

Using this documentation, the follow-up foreman discusses training problems with staff and foremen. Care is taken so that records do not become evidence against an hourly worker in grievances or in upgrading considerations. This way, Koppers can assure the union that training of men already on the job will not affect their current status.

Training staff — Most serious problem to overcome, says Craig M. Gault, formerly maintenance superintendent and now plant training director, was using instructors relatively unskilled in manual arts to tell old hands the right way to do a job. For this reason, Koppers selected trainers not so much for their technical proficiency as for their ability to get ideas across. A look at the organization chart (p. 138) will give you an idea of the type of men Koppers feels it needs to run a really successful program.

Related training for foremen—Long before the maintenance skills training program began, the plant had embarked on a supervisory development program. But Gault soon felt this program was not enough, since the maintenance foreman's job is unique, with responsibilities and working conditions all its own. So he set up a special course for trades foremen. It hits hard at foremanship fundamentals as applied to maintenance problems. These foremen are split into three groups, meet in training conference for two hours twice a month.

In addition, all foremen take Koppers' tailormade version of JIT. Following Kobuta's instruction manuals for each trade, foremen get an intensive 12-hour training in how to be better teachers.

Training payoff — Results have been substantial, if not spectacular. Since Koppers only recently introduced measured daywork standards, no documented "before" and "after" comparison can be made. But estimates are that work quantity is up 20%; quality—best ever.

As for attitudes, Gault observes: "We've noticed among mechanics a renewed pride in work. We didn't expect the terrific interest they'd have in the program. It's never fallen off. Of course, lots of the men thought the course would be a vacation — until they began. You hear comments now that it was tough, but worth the effort. They've learned to know and respect the abilities of their foremen and of men in other trades."

Charles Burton, divisional industrial relations manager, is somewhat less enthusiastic. He says, "AT is no panacea. But we're sticking with it. We've trained 102 men to date —including 40 pipefitters, 7 electricians, 8 insulators, 12 millwrights, 3 painters, 6 riggers, 7 welders, 8 instrument men. Results warrant our continuing until every maintenance man has had it."

Some drawbacks—If lots of advance planning, the drudgery of analysis and program design, and persistence to follow through are drawbacks, then AT is full of them. In practice, however, Koppers found only these two limitations:

. . . *Cost*. Salaries for trainers alone run over $50,000 a year—although the bulk of this figure will be non-repetitive once the program is completed. Time lost off the job is about $550 per trainee. Add to this the cost of getting the program underway, preparing manuals, and refinishing the training room—and you're talking a lot of money. Of course, not every AT program need be run so elaborately. But training and maintenance experts are more and more coming to the conclusion that there's no easy road to skills training. If it's to be done right, and done permanently, management must spend money to accomplish these results. That's how Koppers looks at it.

. . . *Plant size*. Kobuta is about an ideal size for this type of retraining in groups. Six to 12 mechanics can be separated from the 240-man maintenance department at one time without seriously damaging efficiency. In smaller plants, Koppers isn't sure this will be true. For them, Koppers feels that short, spot training efforts for special needs will provide the answer.

Try This Self-Appraisal—Now

These days, good plant executives move up fast. How good *you* are will become clear when you take this self-analysis quiz. It's British, blunt, and rugged.

FIRST STEP in becoming a better plant executive: Find out how good you are — and where you fall short. So you can hold onto your virtues while you mend your faults.

Self-appraisal is the key. But, if it's to be worth anything, it has to be rigorous. You'll have to face up to yourself as you are—be honest, blunt, even rough on yourself. To do that, you'll need help. And that's why we bring you the six groups of questions below. They're taken from 17 groups of questions that add up to the most searching self-appraisal questionnaire we've seen in a long time. They get at the very roots of managerial performance. They mince no words. And, if *you* mince no words in answering them, you'll get a true picture of the kind of plant executive you are—and how to become a better one.

1. ACCESSIBILITY

Is your day-to-day routine work on a time-basis that allows you adequate free time for contact or consultation with both your superiors and your supervisors, as well as your workers?

Do you make yourself available at specified and sufficiently frequent times to meet workers' representatives, supervisors, trade representatives, salesmen, and so on?

Are you always readily accessible to subordinates for discussing their personal, domestic, or private problems not directly concerned with their work? Alternatively, do you consider this unnecessary? If so, why? Do you habitually avoid or delegate such meetings on the grounds of lack of time or interest?

2. THOROUGHNESS

Is your planning work characterized by a mass of incomplete, irritating loose ends? Or do you find it easy to finish one job before taking up a fresh one?

By W. M. HALLIDAY
Southport, Lancashire, England

Are you always assured that a workmanlike and comprehensive job has been done on any new work projected by you or your superiors?

Do you find it easy to defer, delay, or relegate the performance of important, difficult, or unpleasant tasks?

Are you slip-shod and disinterested in your attention to the innumerable minor details of office routine, works organization, or personal relationships?

Are you easily satisfied and content to be superficial in your activities, by allowing enthusiasm to flag? Or your attention to wander to other matters, provided the particular job gets done somehow?

3. PUNCTUALITY

Do you make a keen point of always being on the job at the official starting and finishing times? Can you honestly say your time-keeping is a good example to subordinates and workers?

Are you consistently punctual in attending all appointments, consultations, and meetings with both top management and supervisors? Do you find it easy to be unpunctual at meetings with persons down the ladder from you? If so, what are the reasons?

4. ENTHUSIASM

Is it true to say your prevailing outlook and attitude is enthusiastic for all jobs on hand? Or do you tend to get "under the weather" easily—become querulous, snappy, agitated, and non-plused, especially when things go wrong?

Are problems and situations repeatedly arising in factory or office — between yourself and workers or supervisory staff members—that destroy your enthusiasm? If so, do you ever take trouble to ascertain why this should be so? And what can be done to correct it?

Are you able to infect your associates, especially those of supervisory status, with your enthusiasm for particular jobs? Do you take positive steps to impart your enthusiasm to all concerned? Have you thought out the best means for accomplishing this?

5. COURTESY

Can you truthfully say you are consistently cheerful, considerate, courteous to every member of your works and office staffs, regardless of grade or personality?

Do you tend to be easily put out when people don't behave as you had anticipated? Or when things don't run smoothly according to your expectations and planning?

Do you regard and treat each member of your staff primarily as a person and not simply as a unit in the production scheme of things?

Are you likely to ignore or override personal prides, feelings, and dignities of workers? Do you employ harsh language or adopt unaccommodating attitudes that deliberately or unconsciously belittle and affront personal feelings?

Do you find the only way—or the most effective way—to achieve your objective is by adopting the heavy threatening hand, especially with lower-grade workers? Do you often have to threaten them with penalties and dismissal to get your way?

When issuing oral or written instructions for transmision to workers, do you always give careful consideration to your choice of words with a view to demonstrating your interest and courtesy?

What means do you regularly adopt—or deem to be necessary—to insure that all supervisors in your charge are equally courteous and scrupulous in their langage and dealings with subordinates?

6. INDUSTRIOUSNESS

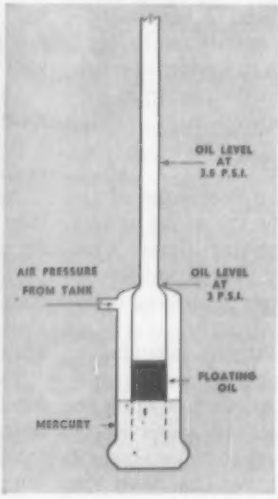
Do you actually perform a fair day's work? Have you a tendency to spend too much time in the office, so workers are unable to assess just how you spend your time or exactly what you are about?

By WALTER F. WAGNER JR., Associate Editor, FACTORY

Roll 'em Over Easy

Problem at National Homes Corporation's brand-new Tyler, Texas, plant: How to turn unwieldy wall sections over—after one plywood skin has been installed—to install the second plywood skin.

Solution: The roll-over device shown here. It consists basically of two parallel lengths of roller conveyor about six inches apart, positioned in a circular frame. The panel—one plywood side in place—is slid between the two conveyors, and the device rolled over by a motorized friction drive. Held snugly between the two conveyors, wall panel is turned over, then rolled out for next operation.



Super-Sensitive Pressure Gage

This ingenious—yet simple—pressure gage is used in testing fuel tanks built at Ryan Aeronautical Company, San Diego. To insure fuel tightness, the tanks are pressure-tested at 3.5 psi. for 45 minutes. Leaks are detected by measuring any pressure drops. Originally, water manometers were used. However, since 1 psi. will support a 27-in. column of water, the device (visible behind operator) was an unwieldy 10 feet high. Mercury manometers, on the other hand, were not sensitive enough.

The new manometer is a combination-fluid type. The amount of mercury in the gage is such that at 3 psi., the oil is at the base of the fine tube. When the 3.5-psi. pressure is applied, the oil shoots up the tube for 13½ inches—the rise for a ½-psi. increase. And even 1/500-psi. decreases in pressure can be detected on the 13½-in. scale.

Stacking Bags Made Easy

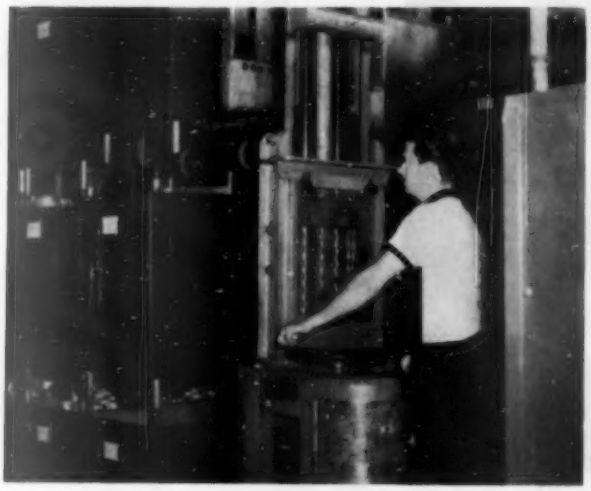
Want to stack pallets of bagged material? With no wobbling or worry? Then you'll like this simple flattening device, dreamed up and installed at the Evansville (Ind.) plant of Iglehart Bros., Jello Division, General Foods Corporation.

The platform, which cost only $250 to construct and install, is 5½ feet above the floor. To use it, the truck operator positions his load of bags directly under the platform, raises the load until the top bags contact the platform. A little extra push, and the load is flattened, presenting a firm base for later pallets piled on top. Master-cylinder bypass valve on truck prevents damage to truck, platform, or bags if operator tries to squeeze too hard.

As a direct result of more stable tiering, possible with "flattened loads," material loss was cut $1150 per year. And the warehouse is a lot neater.

Eight-Fold Productivity Boost

That's the record chalked up on this operation at New York Progressive Wood Heel Company, Brooklyn, N.Y. The operation: driving screws to attach leather lifts to plastic heels for women's shoes. (The lifts have previously been cemented, and lift and heel drilled). This operator can now turn out 2000 parts in the time it used to take him—hand-placing screws and using a manually operated screwdriver—to turn out 250. The unit, developed and built by Pneuma-Serve, Inc., Cleveland, works this way: When the operator pulls down the handle, a valve opens, releasing air, and a screw is driven through the Pneuma-Serve head mounted on the driver. After each such cycle, the next screw is delivered almost instantly through a plastic hose from the hopper. Two men—one positioning heels, the other actuating the unit—can cut cycle time to 1 second.



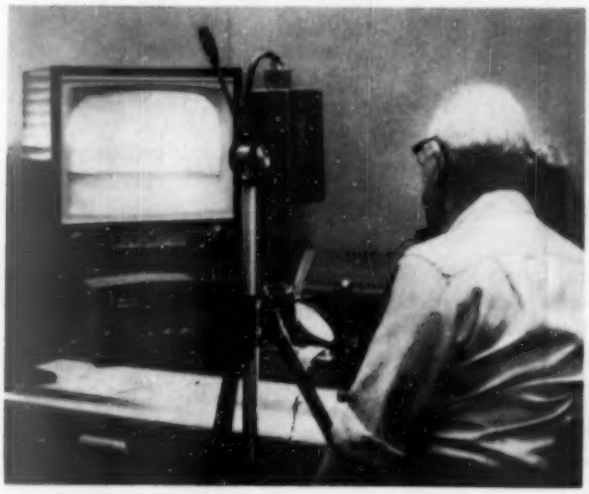
Stackable Trucks

Skil Corporation (Chicago) has doubled the usefulness of its 3200 hand trucks, and tripled the usefulness of its storage space. Just by bolting a section of ordinary pipe to the corners of each truck. The pipe, which extends 2½ inches above the truck body, 4 inches below, enables handlers to stack trucks three high—quickly and steadily.

Tips on bottom ends of pipes help handlers position trucks accurately. When trucks are rolling, bottoms of pipes have a ¾-in. clearance of floor.

Pipe alterations add about $10 to cost of the 2000-lb.-capacity trucks (which normally cost $60).

Improvement on an improvement: When new trucks are needed, Skil plans to extend the angle-iron corner reinforcement of the trucks, use the reinforcement instead of the pipes for stacking. This will accomplish the same result at even lower cost.



TV and Mike Team Up

And they give inspectors at American Can Company (Cincinnati) a big look at a mighty small scene. It's the inspectors' job to spot tiny imperfections on the razor-sharp edge of chrome-plated scraper blades used in lithography machines.

Inspectors used to check the blades by passing them under a microscope. But, say Canco execs, they get the job done twice as fast, and with greater accuracy, using this new system. A small television camera is mounted on the eyepiece of the microscope. As the blade (visible under camera and spotlight) is passed under the microscope, an image 288 times actual size is transmitted to the receiver. (The razor edge is visible on the screen as a 4-in. bar.) The thin vertical lines on the screen indicate tolerance limits. Any blade with an irregularity that exceeds the space between the lines is discarded.

By W. A. STANBURY JR., Associate Editor, FACTORY

PAPER TAPE, coded from blueprint, guides cutting tool.

New Step in Automation

This electronic machine talks to itself (if it makes a mistake), cuts production time to a whisker.

The brand-new electronic machine that you see in the photo above turns a blueprint into a finished product for Bendix Aviation Corporation. It was invented and developed by Bendix researchers, has been used for almost a year for automatic production of a cam system that's the heart of a jet engine fuel-metering and fuel-control system. In two to four hours, this machine accomplishes a job that used to take from 400 to 500 man-hours.

Coded blueprint information is punched into a paper tape. A computer then reads the tape, sends instructions through a servomechanism to the cutting tool. The cam comes out just right. Bonus benefits: Computer checks itself for errors, makes adjustments (if needed) while the tool cuts the cam.

Better Sawing

Got a sawing problem? Here are suggestions from Rockwell-Delta:

1. Tooth setting and operating speed should be varied with the job.
2. The softer the metal, the higher the cutting speed (except for friction sawing).
3. Two teeth should always be in contact with the edge of the work when you're sawing thin metal.
4. Coarse-tooth blades are best for softer metals.

What's more, Rockwell-Delta provides the following table as an approximate guide to better sawing (E, every tooth set; R, regular set; W, group set):

BLADES AND SPEEDS

Material	Speed fpm.	Teeth per inch	Set
Aluminum-alloy gates	125	8-10	E
Aluminum sheets	2200	8-10	E
Asbestos sheets	125	8-10	E
Babbitt	340	10-14	R
Bakelite	340	5-10	E
Brass: cast, soft	340	12-14	E
Brass: cast, hard	125	18	W
Brass sheets, tubing	340	14-18	E
Bronze, manganese	125	10-14	R
Bronze moldings	175	18-24	E
Builders board	2200	12-14	E
Brake lining	125	8-12	E
Carbon tool steel	80	14	R
Cast iron	125	14	R
Cold-rolled steel	175	14	R
Copper	175	10-12	E
Drill rod	80	14	R
Fiber	340	8-10	E
High-speed steel	80	14	R
Hose: canvas, rubber	2200	8-10	W
Hose: metallic	250	18-22	W
Iron bars, machine steel	175	10-14	R
Iron sheets	175	18-22	W
Malleable iron	175	12-14	R
Plymetal	175	14	E
Mica	175	10-14	E
Monel metal	125	10-12	R
Nickel steel	80	12-14	R
Pipe	125	18-22	W
Radiator cores	340	18-22	W
Rubber, hard	340	10-14	E
Slate	80	10-14	E
Steel moldings, special shapes	125	18-24	W
Steel tubing	125	18-24	W
Transite	175	14-18	R

TWO NEW IDEAS for freight cars promise faster loading, unloading.

New Look in Freight Cars

The two photos shown above bring new ideas to railroad freight-car design. The Unit Load Car (left) is a radical departure that may cut 10-hour loading time to as little as 10 minutes. The special door (right) is one man's new solution to the problem of doors that are too narrow for bulky shipments.

The Unit Load car (designed, engineered, and made by International Steel Company, Evansville, Ind.) was shown for the first time at the recent Cost Reduction Clinic of Calumet Industrial District Company, Chicago. Four rugged partitions divide car into five compartments. Panelized overhead doors roll up and slip out of sight in seconds, make car accessible from either side. Compartments permit single shipments of various products in one freight car. Fork trucks enter easily through wide doors. Two men, using a fork lift, load and unload car in 10 minutes—an operation that requires 10 to 16 man-hours with standard box car. Quick job means fast turn-around for railroad cars.

Now look at the special door (right photo). Julian Foss, Stevenson Plywood Corporation, Stevenson, Wash., surveyed big shippers, found most of them would prefer a 9-ft. door opening on freight cars (to accommodate fork trucks with wide loads) if some satisfactory closure were available for bulk shipment, such as grain. Mr. Foss invented such a closure—a fabricated steel and plywood door hinged at the upper part of the door opening. When in use, it rests vertically against the jamb. When not in use, it hangs on chains against the car ceiling. It's designed to support a 30-ton load.

Oil Wells? Guess Again

The deepest hard chromium plating tank in the country—that's what it is. But your first guess wasn't a bad one, at that. What you actually see in the picture above is an oil derrick that Superchrome Engineering Company, Los Angeles, has converted for hoisting and lowering long tubing and rods into position for plating.

The deep tank is set in a 43-ft. pit, extends 2 feet above ground. Holds 2350 gallons of chromic acid solution. Makes it possible to hard chromium-plate inside of core and oil barrel tubes up to 6 inches in diameter and 43 feet long. Takes only 8 to 24 hours to do a typical core and tube barrel job at cost of $20 to $250, depending on size and type of item and thickness of deposit. Plates not only oil field tubes but also calendar rolls for rubber, steel, paper, other industries. Capacity: 120 core and tube barrels per month.

Inspection at Low Cost

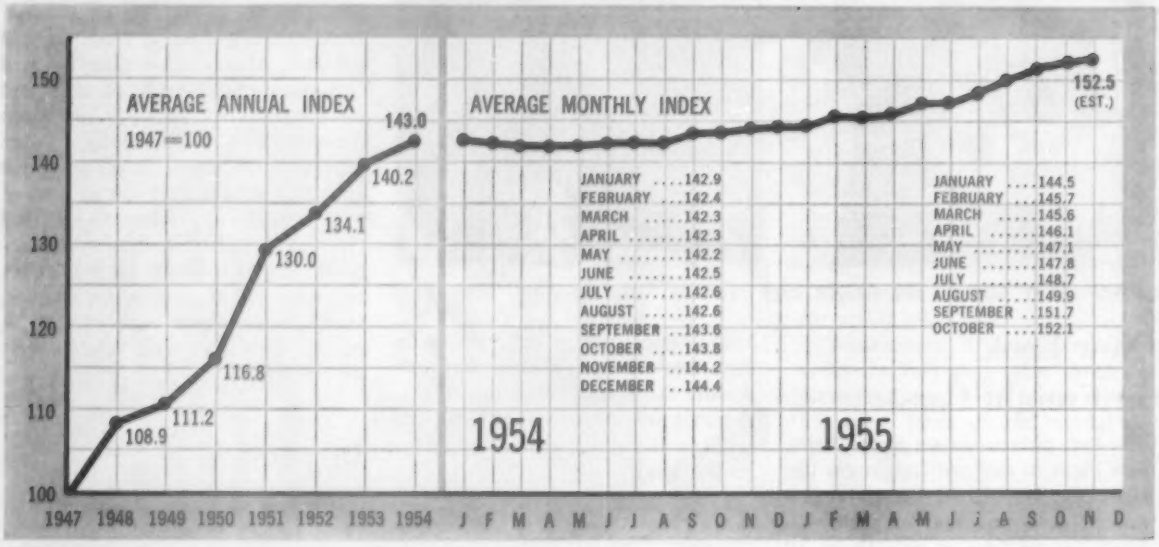
Doctors have long x-rayed people's chests on a mass basis. Now you can x-ray (and thus inspect) heavy products (like castings, ordnance, weldments) on a mass basis.

How? With photofluorography. It's a miniature-film technique that slashes cost of film and processing, cuts size of equipment and quantity of chemicals needed. Typical installation will put the irradiation source and the x-ray camera a-straddle a conveyor line carrying products. When product stops in front of camera, it will automatically start up the x-ray source and make camera bring a film into position. With picture snapped, the conveyor will move on, bring the next part into position.

Photofluorography solves a tough technical problem. It gets the effect of focused x-rays (which can't be focused) by interposing a fluorescent screen, sensitive to x-rays, between object and film. Visible light, excited from screen by x-rays, can then be focused on small-size film.

The new technique was revealed just recently, when the annual W. D. Coolidge Award was conferred on Daniel Polansky, U. S. Naval Ordnance Laboratory, White Oak, Md., for his development work. Occasion for the presentation: annual meeting of the Society for Non-Destructive Testing. Sponsor of the award: General Electric Company.

FACTORY | COST INDEX



Will the Up-Trend Persist?

High level of production and plans to expand and modernize plants suggest it will.

FACTORY's COST INDEX rose moderately in October. Chances are it may pick up more sharply in November. Increases in labor costs may be a major influence. Unemployment is now low. And production is high, with industry planning to invest heavily in new plants and equipment.

If industry turns out the materials needed, labor may put in a good bit of overtime. Overtime rates plus scheduled wage increases may push the labor portion of the Index higher.

All signs indicate the scuffle for industrial materials may be rough-and-tumble in the months ahead. So pressures toward price increases will be strong. Good profits — and the prospect they'll continue good — may hold them somewhat in check.

* * *

FACTORY's "Cost Index of Plant Maintenance" keeps you informed of monthly changes in cost of 1) upkeep, repair, and replacement of plant buildings and facilities; 2) upkeep and repair of operating equipment. Source of all figures: *U. S. Bureau of Labor Statistics.*

For complete information—including cost indexes for the 6-year period 1948-1953, and "10 Ways to Use the Cost Index"—send for a 16-page reprint of "FACTORY's Cost Index" (originally published in January 1954). Price 50¢. Address Editor, FACTORY, 330 W. 42nd St., New York 36.

	AVERAGE 1954	PREVIOUS MONTH (Revised)	LATEST MONTH (Oct.)
Building and Facilities Index	**139.6**	**146.7**	**147.0**
Materials	125.7	134.7	135.1
Brick	132.6	139.2	140.4
Elec. fixtures	115.1	121.2	125.0
Elec. switches, boards, fuses	141.9	153.5	153.7
Elec. wire, copper	130.3	165.2	165.2
Glass	137.3	145.2	152.2
Gutters, spouts, ducts	144.5	158.1	158.1
Gypsum products	129.2	129.2	129.2
Heating equipment	120.0	123.0	123.1
Lumber	124.2	134.5	134.3
Millwork	149.6	146.9	146.9
Paint	114.4	116.4	116.6
Pipe, cast iron	140.9	147.9	147.9
Pipe, steel	148.0	163.3	163.3
Pipe & tubing, copper	142.7	177.3	183.8
Roofing	110.5	121.8	121.8
Sanitary fixtures	144.3	151.5	151.5
Sash, metal frame trim	134.1	151.7	151.6
Solder	115.8	122.2	121.8
Steel, structural	170.3	186.5	186.5
Tanks, steel	121.0	131.2	131.7
Valves & fittings	130.6	141.3	141.8
Wire mesh	155.7	167.5	170.4
Labor	148.8	154.7	154.9
Carpenters	143.4	145.5	146.0
Electricians	152.1	157.6	157.6
Painters	151.8	161.1	161.1
Equipment Index	**144.5**	**153.8**	**154.3**
Materials	136.7	149.0	149.6
Abrasives	129.7	133.0	134.6
Alloys, non-ferrous	117.6	149.1	149.5
Bars & plate, steel	177.8	189.8	189.8
Bearings	140.7	145.5	145.5
Belting	135.1	146.1	148.0
Bolts, nuts & screws	174.9	187.3	189.5
Chain	137.6	162.2	161.8
Controls (electrical)	141.9	153.5	153.7
Gear-reduction units	143.8	151.9	151.9
Hand tools, mechanics	157.8	166.2	168.3
Lubricants	63.9	67.1	67.5
Motors	124.7	126.5	126.7
Non-ferrous metals	121.3	147.3	147.3
Precision tools	126.9	137.9	137.9
Pumps	143.2	149.5	153.1
Tools, cutting	129.0	150.3	150.3
Valves & fittings	130.6	141.3	141.8
Labor	145.9	157.0	157.4
All mfg. labor	146.0	153.6	153.6
Machine tool labor	153.2	160.4	161.2
FACTORY's COST INDEX	**143.0**	**151.7**	**152.1**

AT THE PLANT MAINTENANCE SHOW

Let's Talk About Productive Maintenance

Learn the latest about productive maintenance and spare parts inventory control by visiting Remington Rand Booths 1348 and 1352 at the Plant Maintenance show at Convention Hall, Philadelphia, January 22 through 26, 1956. Learn about Remington Rand Kardex, the ideal basis for both.

For preventive maintenance, Remington Rand Kardex combines in a single, accessible record complete information about each machine. Colored Kardlok signals let you review your entire program in a matter of moments. For spare parts inventory control, Remington Rand Kardex provides that effective replacement parts control system without which valuable production time is lost and machine down time greatly increased.

Both these applications of Kardex are discussed in FREE Booklet X1383, "Assured Equipment Productivity Through Maintenance Management." Pick up your copy at the Show, or write today to Room 2238, 315 Fourth Ave., New York 10, N.Y.

Remington Rand
DIVISION OF SPERRY RAND CORPORATION

By CARL G. WYDER, Maintenance Editor, FACTORY

DISPOSABLE paper wipers eliminated a fire hazard at Tung-Sol. Workers no longer hoard oily wipers in nooks and corners to invite spontaneous combustion.

How to Wipe Out a Fire Hazard

With throw-away paper wipers. No oily ragpiles to flame up, no laundry bills. And workers like 'em.

No fire hazard here. The worker in the picture above is using a paper wiper in a machine shop. When he has finished with the wiper, he'll stuff it in a receptacle to be burned with other used paper wipers at the end of the day. Besides safety, look at these benefits:

. . . *A cleaner shop.* With a receptacle close by, workers don't throw dirty wipers on the floor.

. . . *Less lost time.* Wipers are issued by the box. Workers don't have to trot back and forth with an armful of cleaning rags.

. . . *Cleaner clean-ups.* Paper wipers are highly absorbent, leave no lint. Tung-Sol Electric, Inc., Newark, N.J., where photo was taken, uses them even to clean TV tubes inside and outside. And they're just right for taking oil and grease off machine tools and dies.

. . . *No laundry bills.* Tung-Sol used to have to collect dirty rag wipers, count them, send them to the laundry, store them when clean —and pay a big laundry bill. But not any more.

How did Tung-Sol get started on paper wipers? After the big Livonia fire ("What the GM Fire Means to You," FACTORY, November 1953) top management ordered all Tung-Sol departments to survey fire hazards. Among less obvious dangers, plant men found workers were squirreling partly used oil rags behind benches, in corners, under machines. About the same time, they heard about paper wipers from a representative of Scott Paper Company, Chester, Pa. *Result:* A 90-day trial that made everybody happy.

Now Tung-Sol uses the wipers for many jobs—cleaning TV tubes, wiping off stock that must be micro-measured, taking grease off hands and face. And they have enough wet strength for use with solvents.

Plan Now to Attend Maintenance Show

It's in Philadelphia's Convention Hall, January 23 to 26 inclusive. A good place to pick up new equipment ideas for cutting your maintenance costs. L. C. Morrow, consulting editor of FACTORY, is general chairman as usual.

The concurrent conference sessions will show you how other plants are solving plant engineering and maintenance problems that, chances are, are also yours. Here is the one big chance to swap ideas on the spot with hundreds of practical plant men. Also you can draw on them for advice in question-and-answer periods at every one of 26 sessions (18 of them are repeated).

Many new subjects are up for discussion. For complete program, write Clapp & Poliak, Inc., 341 Madison Ave., New York 17. And get your confirmed hotel reservations early, so you can count on a good night's sleep. You'll need a fresh start every day to get the most out of this big conference and its several acres of exhibits.

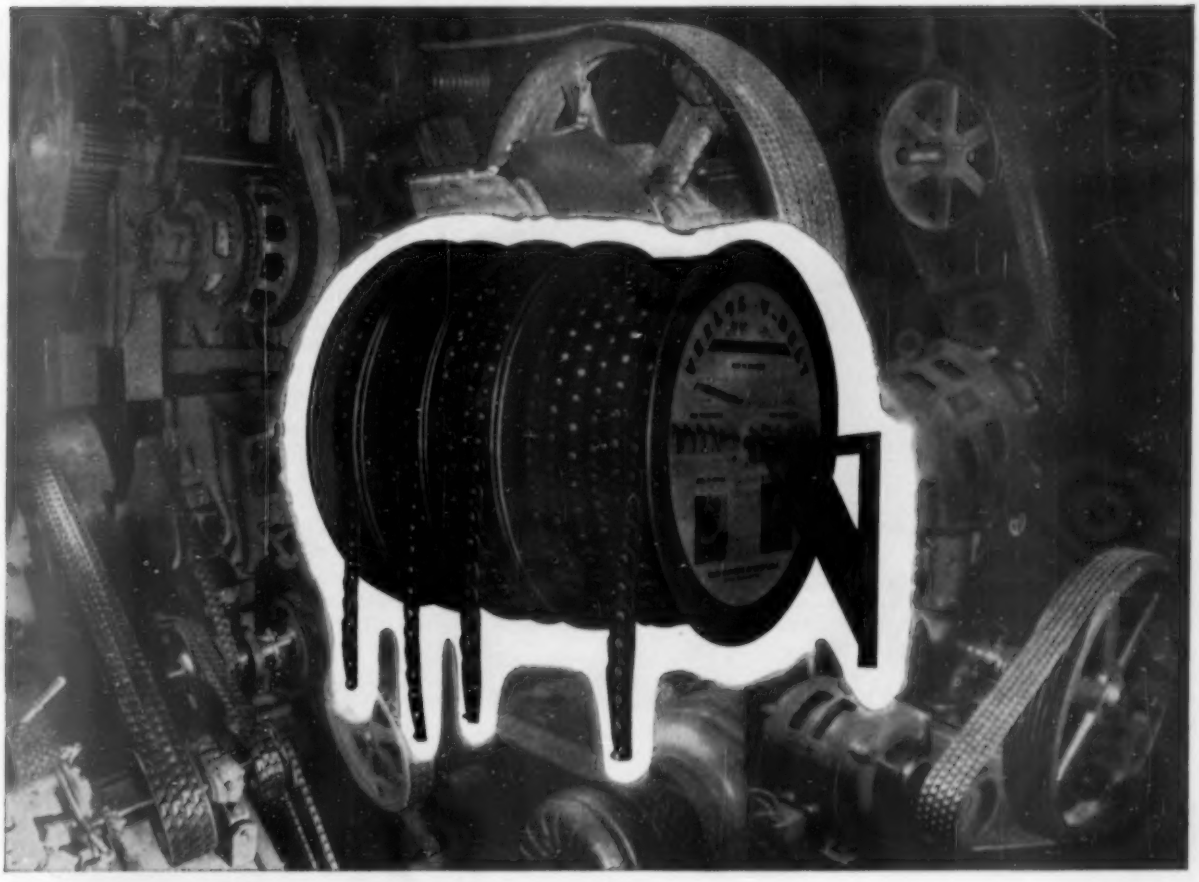
How to Tell When to Repaint

Use a different color for each successive coat, says Graver Water Conditioning Company, New York.

Graver evolved this "rainbow" system to help users preserve its units — filters, chemical storage tanks, feeding tanks, etc.—which handle liquids and chemicals needing corrosion-protective coatings.

Although Graver applies proper coating at installation time, the user must know when recoating is necessary and whether a coating has deteriorated faster at one place than at another.

Answer: Graver now applies five to seven different-colored coats of paint at installation. As coating wears, user can tell from the color where greatest wear is.



THIS *one* V-BELT INVENTORY
keeps your drives on the go

Take a look at the illustration above—there's a *complete* v-belt inventory. Those four 100-foot reels of Veelos—the adjustable v-belt—in the O, A, B and C widths can replace up to 316 different sizes of endless v-belt. Of course, when you use only one or two widths of v-belt, you stock reels of only those widths. This 4-reel Veelos v-belt inventory is easy to maintain, stores in a space only 16 inches square, and is ready when you want it.

But inventory saving is just a part of the Veelos story.

Veelos adjustable v-belt is *easier to install*—in many cases installation is completed in 50% to 90% less time.

Using Veelos means you don't have to re-set motors or remove outboard bearings. Veelos v-belts provide *vibrationless, full power delivery.* A demonstration on an electronic vibration analyzer will show you and prove to you that Veelos v-belts *reduce vibration up to 90%!*

Switch to Veelos adjustable v-belt—the one v-belt that keeps your drives on the go. See your Veelos distributor. Write for your copy of the facts-packed Veelos Data Book.

MANHEIM MANUFACTURING & BELTING COMPANY
604 Manbel Street, Manheim, Penna.

VEELOS
THE BALANCED
LINK V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Veelos is packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

By F. W. MICHAL, Electrical Editor, FACTORY

METERS here aren't metering. They're cutting cable-maintenance costs.

New Cable-Maintenance Trick

Very little cable trouble. That's the word from Southwestern Bell engineers. They're using a new maintenance technique. This method uses gas meters to indicate the presence of trouble spots in telephone cables. Here's how:

A compressor-dehydrator unit is used to supply air at 10 psi, and minus 40 F. dewpoint. The dehydrated air is applied under pressure inside the sheath envelope of cables (dryness prevents damaging paper and pulp insulation on conductors). The air forced into the cables is measured by No. 150 Emco meters (Rockwell Manufacturing Company, Pittsburgh). The meters are read weekly, and the reading is compared with the previous week's. As long as the reading remains constant, maintenance men know the cable has no breaks. But any change in reading indicates a leak in the cable sheath, which can be located and corrected before a serious service interruption occurs. Southwestern Bell reports there is "very little cable trouble" in the Brownsville (Tex.) exchange area, where the system is installed, as compared to surrounding districts not so equipped.

Now You Can Lease Batteries . . .

. . . and chargers, too. Result, says Exide Industrial Division of The Electric Storage Battery Company, Philadelphia, which offers the plan: Elimination of cash outlays for battery and charger reduces average initial cost of an electric truck chassis, battery, and charger by about $2800. This brings average initial outlay for electric trucks within range of original cost of trucks powered by other means. And cost of charging current plus cost of leasing battery and charger is comparable, says Exide, to cost of fuel and oil for trucks of other types. In effect, electric truck users pay for their power as it's used.

Purchasers of trucks may select any of several Exide leasing and purchase-option agreements, spread over periods of up to five years.

Note on a New Hazard

It comes from National Safety Council's *Safety News Letter*, which reports that fumes of selenium dioxide are produced when selenium rectifiers overheat or burn out.

The publication continues: "The U.S. Bureau of Standards advises that under normal, well-ventilated conditions, the fumes of overheated selenium stacks should have no toxic effects on human beings. But harmful results are possible . . . in a close, poorly ventilated space."

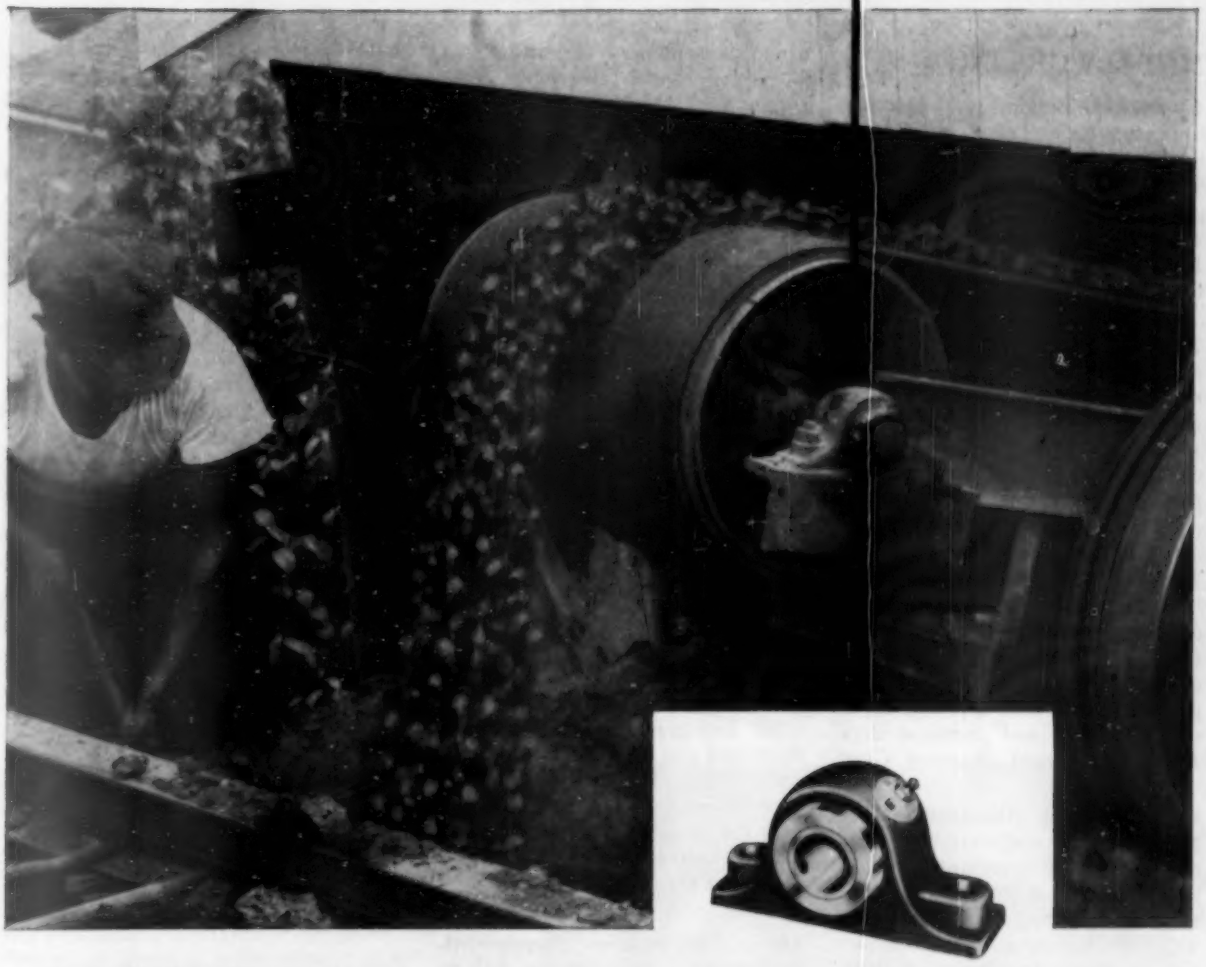
Arc-Proofing Cables

Con Edison engineers say it's easier, faster, cheaper to do it as shown above, instead of the time-consuming and messy job of coating high-tension cables with the standard sand-and-cement mixture.

The new method used by Consolidated Edison (in the electrical distribution system in New York City and vicinity) is to apply an undercoating of asbestos in 10-ft. lengths. An outer layer of impregnated asbestos follows, and is secured by neoprene - impregnated Fiberglas cord. Glass cord was selected partly because it won't burn, and partly because it can best withstand heat from arcing or accidental fire. No failures have been reported in 18 months of use.

COMPLETELY ASSEMBLED
FACTORY ADJUSTED
PRE-LUBRICATED

SEALED
—ready to mount on the shaft!



DODGE-TIMKEN *America's Quality Pillow Block*

Extra measures are taken to build superior quality into Dodge-Timken Bearings; and extra precautions are taken to keep that quality *intact*—from the factory to distributor to you to your machines.

These bearings are sealed in manufacture—an integral part of Dodge-Timken design. Their inbuilt precision is protected *both on and off the shaft.* That is one reason why they easily deliver a minimum of 30,000 hours of service. Want evidence? Look around you. No other pillow block is so widely used on the nation's tough jobs. Dodge-Timken dependability has been proved in *millions* of installations.

There are 5 types of Dodge-Timken Pillow Blocks for all types of service, in shaft sizes from 1 3/16" to 10". Also Dodge-Timken Hanger Bearings, Flange Bearings, Take-ups.

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

FACTORY | CATALOG NEWS

To get these catalogs, circle item numbers on the Reader Service Card next to back cover.

METALWORKING

1—Presses. Bulletin 3201 describes equipment for extrusion, metal-forming and drawing, forging, bending, flanging, crimping and straightening, pipe fabricating. Notes applications with photos of typical installations. 12 pages. *Baldwin-Lima-Hamilton Corp.*

2—Surface Treatments. Manual aids selection of treatments to make metal parts resistant to wear, heat, and corrosion. Tabbed sections on specifications, metals charts, applications. Information on repair-replace service. 26 pages. *Texas Alloy Products Co.*

3—Coating. Here's the story on "Laqua," a material for preserving clean surfaces of metal obtained directly after electroplating or a chemical cleaning operation. Explains dipping and spraying methods. Physical and chemical data. *Fidelity Chemical Products Corp.*

4—Die Casting Aluminum. Characteristics and operation of a combination induction melting and holding furnace and automatic pouring unit are described in this folder (R-48). Photos show control cabinet; unit in action. Installation diagram. *Ajax Engineering Corp.*

5—Airless Blast Cleaner. Bulletin 100D presents a table-type machine for a wide range of work, such as handled in job shops. Contains installation views, engineering drawings, mechanical and electrical specs for four sizes. Explains process. *Wheelabrator Corp.*

6—Stampings. Brochure discusses economy and benefits of their use; standards maintained by this supplier. Lists supplementary operations available. Assures safe maintenance of customers' dies and tools. 8 pages. *Metal Stamping Div., United Shoe Machinery Corp.*

7—Tumbling Barrels. Two-color Bulletin XL-55 describes wet process units for finishing a variety of metal and plastic parts. Makes recommendations for selecting chip media and suitable compounds for various needs. Data on optional equipment. *Tum-L-Matic, Inc.*

MATERIALS HANDLING

8—Cranes. "Planning the Crane for Its Use in Automation" answers many questions about the place of overhead materials handling in the trend toward automation. Cites examples of applications of various types, with the aid of in-use photos. 12 pages. *Whiting Corp.*

9—Conveyors. Aluminum gravity roller and gravity wheel units are illustrated and described in this two-color folder. It shows a "set low" type for small packages, a "set high" type for packages larger than conveyor width, and a tripod support. *Harry J. Ferguson Co.*

10 — Miscellaneous Equipment. Pocket-size Junior Catalog 535 in 100 pages covers many types of trucks, maintenance lifts, batteries and chargers, skids, boxes, racks, stacking frames, elevators, die tables, work benches, pallets, dollies. *Barrett-Cravens Co.*

11—Steel Strapping. Idea booklet of 16 pages contains 54 pictured examples of unitizing, skidding, palletizing, self-palletizing, and bundling a variety of products with strapping equipment. Examples are chosen from different industries. Discusses advantages of method. *Acme Steel Products Div.*

12—Wire Rope Slings. 60 pages of illustrations, charts, and diagrams describes 16 different factory-fitted slings; nearly 2 doz. fittings. Rigger's manual, chart of ratings, standard signals for directing operations of handling equipment. *Union Wire Rope Corp.*

13—Fork Lift Trucks. Advantages of automatic transmission for trucks are discussed in this booklet on "TowmoTorque Drive" (available on all of maker's line). Explains how "Creep-Control" enables "inching" with high engine speed, full lifting power. *Towmotor Corp.*

14—Traveling Cranes. Two catalogs (Nos. 62 and 63) cover motor-driven and hand-powered types. Besides photos and descriptions, they include specifications, schematic diagrams, clearance dimensions, installation photos. 20 pages each. *Reading Crane & Hoist Corp.*

15—Batteries. Here's a 48-page manual on maintenance and service of lead acid units for all types of motive power. Covers methods of repair; simplified testing, including safe practices; correct charging methods; spare parts. Cross-indexed. *C & D Batteries, Inc.*

16—Aluminum Hand Trucks. Folder contains pictures and specs on standard flat bed, multiple-deck, and fixed-end trucks, as well as data on accessories and a variety of special-duty trucks. Tells how they cut weight, work, maintenance. *Magnesium Co. of America.*

17—Lift Trucks. A new series with fully automatic torque transmission is the subject of this 4-color folder. "Phantom view" shows internal features of engine and transmission. Attachments are illustrated. *Yale & Towne Mfg. Co.*

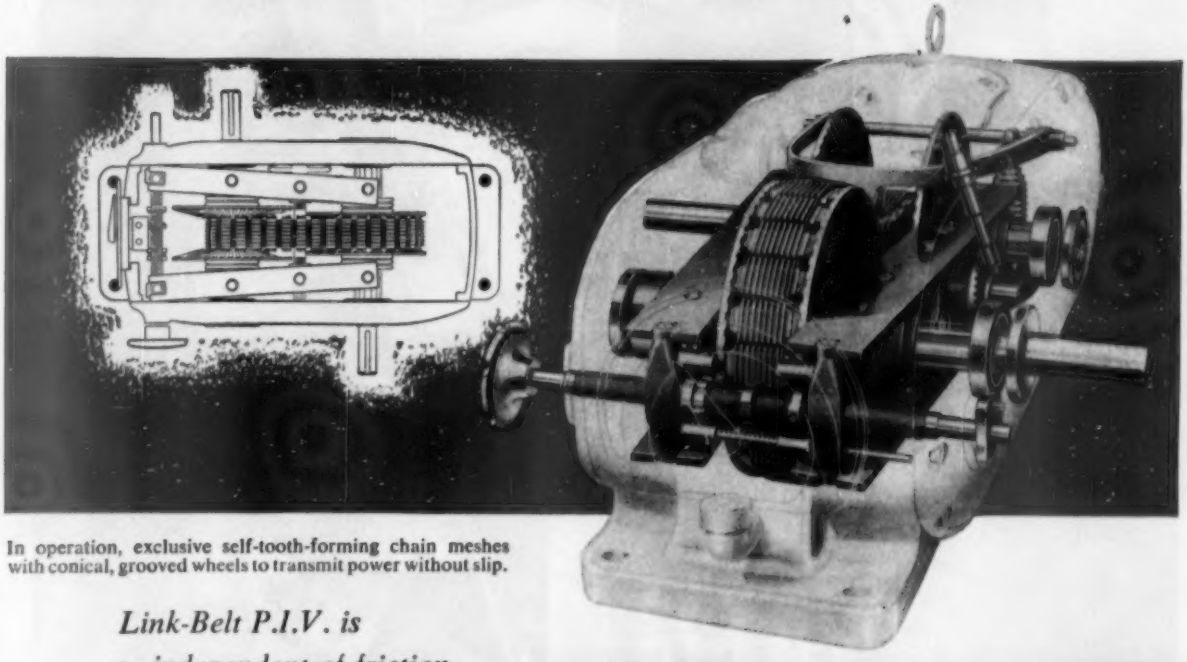
Turn to page 242

OTHER CATALOGS

Buildings ..... p. 242
Materials ..... p. 242
Production ..... page 244
Pipelines & Fittings ..... p. 246
Processing ..... p. 248
Electrical ..... p. 250
Instruments & Controls ..... p. 250
Miscellaneous ..... p. 254

Looking for the accurate mechanical variable speed drive?

IT'S LINK-BELT P. I. V.



In operation, exclusive self-tooth-forming chain meshes with conical, grooved wheels to transmit power without slip.

Link-Belt P.I.V. is

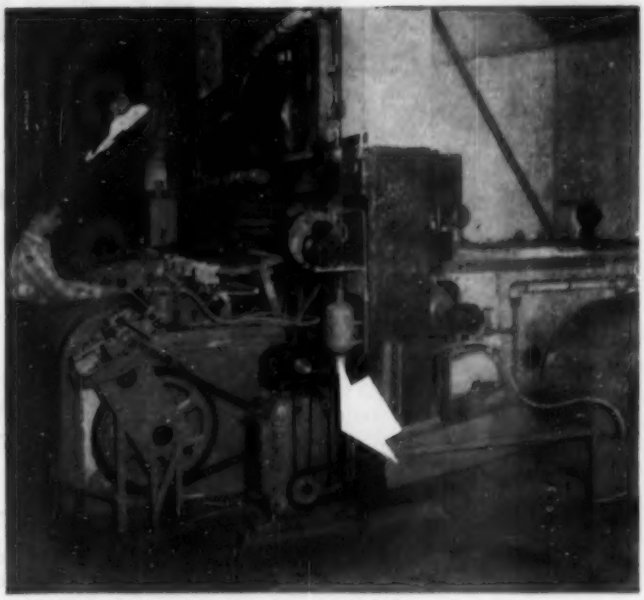
- *independent of friction*
- *all metal*
- *fully enclosed*
- *automatically lubricated*

Here is the Positive, Infinitely Variable speed drive that's not dependent on friction for transmitting power. Instead, its exclusive drive chain with self-forming metal teeth engage with radial grooves in two pairs of cone-shaped wheels. Positive power transmission is assured at all speeds regardless of load.

Movement of the single control screw simultaneously varies effective diameters of wheels on input and output shafts. This makes possible an infinite number of stepless speed adjustments within the range of the drive. Speed of the output shaft can be changed instantly, even while operating under full load.

Link-Belt P.I.V. drives are available in capacities from ½ to 25 hp . . . in 8 sizes and 16 types for horizontal and vertical mounting. See your nearest Link-Belt office or authorized stock-carrying distributor, and write for Book 2274.

LINK-BELT P.I.V. VARIABLE SPEED DRIVE

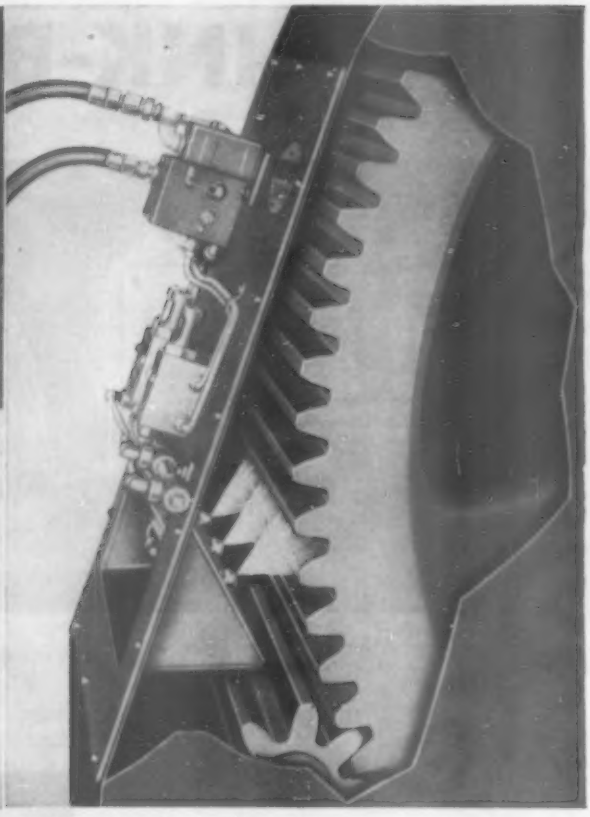


On jute slasher, Link-Belt P.I.V. Variable Speed Drive with electronic control automatically regulates the speed of winding ends onto the beam by control of the moisture content of the material and the accumulating diameter of the wound beam.

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,933

For more about these products, circle item numbers on Reader Service Card next to back cover.

PUMPING STATION can serve two, three, or more panels. Delivers lubricant at regular, electric-timed intervals.



SPRAY PANEL mounted on gear housing shows sound approach for spraying lubricant on pressure side of gear teeth.

Spray Panel Lubricates Gears

Eliminates downtime for hand oiling, saves oil, lengthens gear life, and promotes good housekeeping.

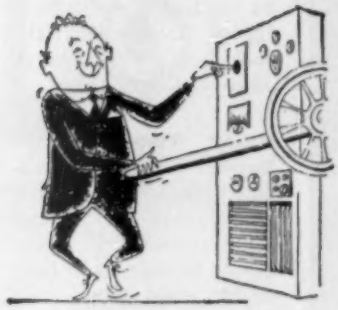
These self-contained panels are fastened to gear housing or framework. They apply lubricant directly to pressure side of gear teeth in a penetrating spray. Lubricant is delivered at regular intervals through a circuit of Dualine measuring valves connected to central pumping units. The measuring valves distribute lubricant under pressure to the spray valves. Panels measure approximately 2x3 feet; feature stainless steel spray valves with built-in nozzles. They're designed for bull gears and girth gears such as on grinding mills and kilns; also other spur or herringbone gear trains.

Farval Corp. (Circle No. 1, Reader Service Card.)

Turn the page

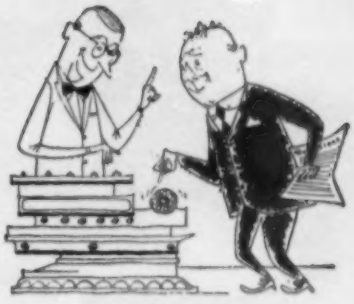
OTHER EQUIPMENT
Air Handling ... 192, 193, 196, 202
Auxiliary ... 156, 162, 168, 176, 180, 182, 184, 192, 193, 216
Buildings ... 156, 164
Electrical ... 156, 159, 168, 174, 184, 190, 200, 204, 210, 212, 214
Maintenance Tools & Supplies ... 156, 160, 161, 172, 176, 190, 193, 198, 204, 206, 212, 216
Materials Handling ... 156, 158, 160, 161, 162, 168, 172, 174, 176, 178, 180, 182, 186, 188, 192, 194, 198, 200, 202, 204, 208, 210, 214, 216
Measuring & Control ... 156, 158, 159, 160, 164, 182, 186, 206
Mechanical ... 158, 178, 200, 202
Production ... 170, 174, 176, 184, 208, 216
Safety & Plant Protection ... 161, 164, 170, 188, 193, 194, 196, 206
Miscellaneous ... 170, 188, 190, 194, 196

Push the button... pull the handle...



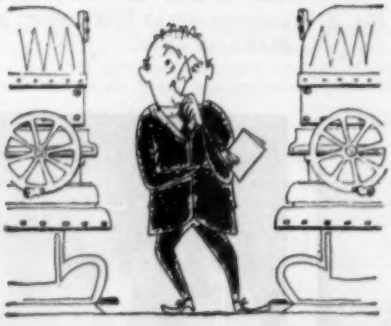
Try out . . . personally . . . the products you need to make your plant more efficient. More than 400 exhibitors of machines, services, supplies, materials and equipment for plant maintenance and engineering will show you new developments, new techniques.

Ask the question... get the answer...



No time delay . . . immediate technical answers to solve your specific, unique problems. Talk directly to the sales engineers and technical experts, in an atmosphere of their products . . . all in one place, at one time, under one roof.

See one... compare another...



Make your choice . . . right on the spot . . . you can see, touch, and try out competitive products side by side. The comparisons and decisions you can make in just four days will enable you to do a better job in your plant.

7th *National*

PLANT MAINTENANCE & ENGINEERING SHOW *& Conference*

January 23 to 26, 1956

Convention Hall, Philadelphia

Write for free tickets to the show and information about the Conference to:

Plant Maintenance & Engineering Show
Clapp & Poliak, Inc.
341 Madison Avenue, New York 17, N. Y.

Attend the Conference too!...

Hear the experts . . . top men in their fields . . . discuss topics of major interest to plant maintenance and engineering executives. There's no other way to get so much information for so little investment.

Sandblast–A New Way to Clean Pipe

Now you can clean the inside diameter of pipes and tubes by whirling sand or other abrasives under great pressure inside the pipe. "Torno-Blast" is merely passed through pipe. Tool does not need to be rotated, nor does pipe itself need to be turned. Conical diverter disperses abrasive over 360-deg. area. Removes alkali deposits and salts of corrosive liquids, millscale, carbon and coke, as well as pitting due to erosion. Also handy for cleaning heat exchangers, vacuum pans, condensers, petrochemical heaters. Four models for ½- to 12-in. pipe.

J. C. Fennelly Co. (Circle No. 2, Reader Service Card.)

3—Batteries are made with polyethylene. Increases capacity, lengthens life 20%. All Exide-Ironclad industrial batteries will use this plastic for tubing and tube sealers that encase active material and grid spines of positive plates. *Electric Storage Battery Co.*

4—Jet Pumps transport solids through pipelines; nozzle tip is located out of path of material flow. Iron pyrites can be transported in same system that conveys bottom ash or furnace slag. Easy to install and maintain. For 4- to 10-in. lines. *Allen-Sherman-Hoff Co.*

5—Electronic Scanner monitors up to 25 production points at speed of either one or five points a second. May be used in processes involving such variables as temperature, level, flow, and pressure. Maintains check on its own accuracy. *Robertshaw-Fulton Controls Co.*

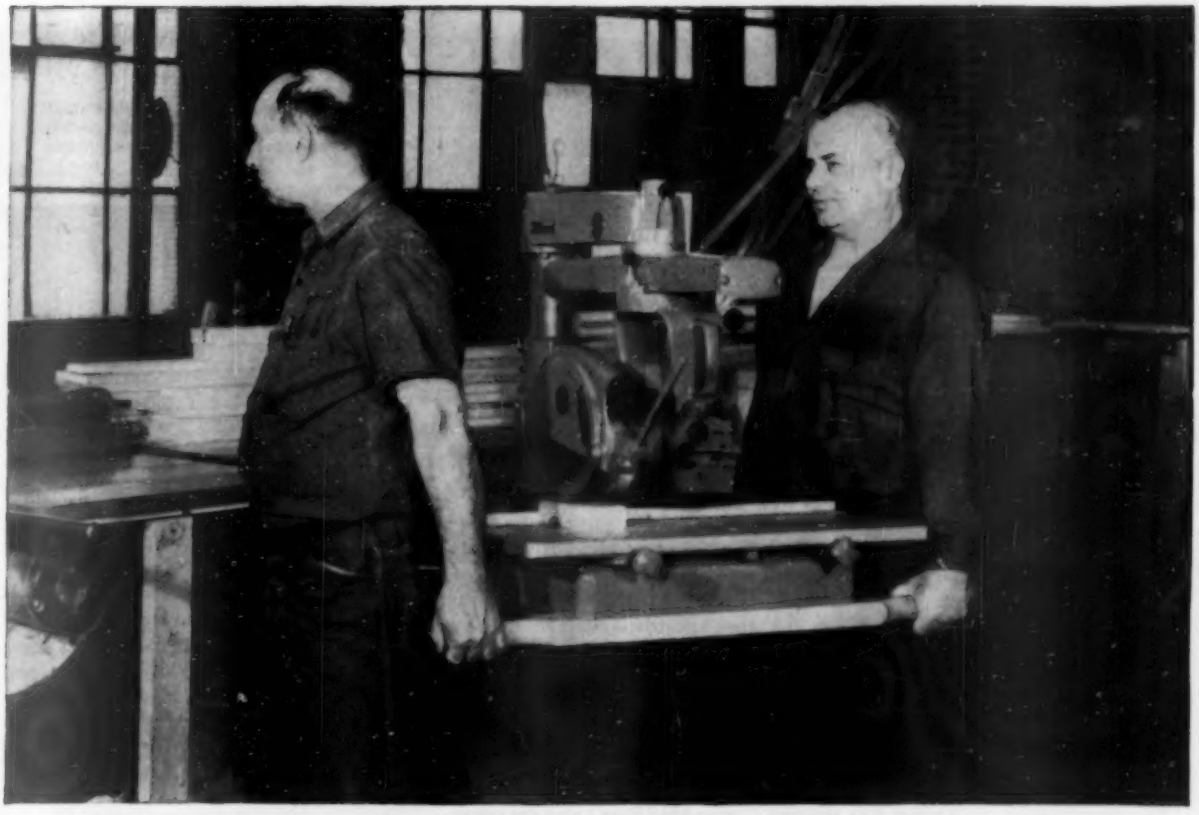
6—Push Insert eliminates tapping internal thread in holes for threaded screw, bolt, or bushing. "PIP" mandrel may be used with drill press, kick press, arbor press, air piston, etc., to drill or core hole into die casting—up to 1200 inserts an hour. *Heli-Coil Corp.*

7—Window admits light while controlling heat and glare. One-piece louvered panel of molded Plexiglas resembles washboard. Each louver combines clear with opaque surface. Admits light only, but many be combined with other frames for ventilation. *Luria-Courand, Inc.*

8—Packing Bench can be tilted (hydraulically) to set boxes weighing up to 1000 lb. on floor. Heavy equipment can be placed on "Hydra-Tilt Table" by monorail and hoist, boxed at convenient working height, tilted to floor to be trucked away. *Valley Craft Products, Inc.*

9—Surface Roughness Comparator illuminates both known standard and piece under study. 10-power eyepiece shows circular image: one half is the standard; the other, sample being checked. Speeds inspection. *Bausch & Lomb Optical Co.*

Turn the page



NEW DELTA Portable Radial Saw CUTS PLANT MAINTENANCE COST

This Rockwell-built DELTA Portable 10″ Radial Saw — the first really portable radial saw — is designed to give you more speed and greater accuracy — *with far less labor cost and material waste* — on maintenance jobs throughout your plant.

Big Saw Performance At Half The Cost

With this precision-built DELTA Portable 10″ Radial Saw you get all the accuracy, all the versatility, of a big radial saw — *at less than half the cost of a big radial saw* — PLUS real portability! Yet it's rugged . . . built to take years of day-after-day use with practically no maintenance.

Does Maintenance Jobs "On The Spot"

Two men easily carry this perfectly balanced, lightweight DELTA Portable Saw — through any standard door opening — *right to the job.* Needless, and costly, handling of materials is eliminated. With its many special, easily installed attachments this DELTA machine not only saves money on routine maintenance, but also replaces expensive outside help in such costly jobs as erecting plant and office partitions.

DELTA ROCKWELL **DELTA** QUALITY POWER TOOLS

Another Product by **Rockwell**

DELTA QUALITY COSTS NO MORE

Let your Delta Dealer *demonstrate* the many ways that this new DELTA Portable 10″ Radial Saw can help cut your maintenance costs. He's listed under "TOOLS" or "MACHINERY" in the classified pages of your phone book. Send the coupon *now* for full catalog information.

Look At All These Money-Saving, Work-Saving Features:

- All cuts made above the table — you see the blade bite the mark
- 360° track rotation over the table — a DELTA exclusive
- Unlimited miter capacity — 0° to 90°, right or left
- Quick-set bevel and miter stops — 0°, 45°, 90° right and left
- Maximum cut-off — 16″ on 1″ stock
- Maximum rip — center of a 48″ panel
- Maximum depth of cut — 3″

Delta Power Tool Division, Rockwell Manufacturing Co.
628-M North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send name of my nearest Delta Dealer.
☐ Please send me Delta AB Catalog.

Name _____ Title _____
Company _____
Address _____
City _____ County _____ State _____

4-wheel drive does another job better!

MOBILE POWER

You can save the cost of an auxiliary engine and the time lost in loading or towing it by putting a 4-wheel-drive Universal 'Jeep' on the job. With power take-off, the 'Jeep' operates air compressors for pneumatic tools as shown above, electric power generators and other belt-driven equipment. See your nearest Willys dealer or write for information.

4-WHEEL-DRIVE UNIVERSAL 'Jeep'®

A member of the 'Jeep' family... world's largest-selling 4-wheel-drive vehicles

Willys Motors, Inc., Toledo 1, Ohio

CINDET

ALL-PURPOSE LIQUID SYNTHETIC DETERGENT

LIFTS DIRT AND HOLDS IT OFF!

Foamy CINDET LIFTS and DRAWS dirt away, SEPARATING the dirt from the surface and leaving space between, then HOLDS DIRT PARTICLES IN SUSPENSION for quick, easy pick-up. Leaves a cleaner, brighter surface than when soaps, powders or ordinary "detergents" are used. Produces rich, creamy suds when diluted in either HARD or SOFT water, and it's SAFE—won't harm hands or any surface unaffected by plain water. Wonderful for stripping old wax from floors and removing stubborn RUBBER MARKS.

CINDET has hundreds of general cleaning uses. Write for literature or have your Dolge Service Man demonstrate its quick, thorough action.

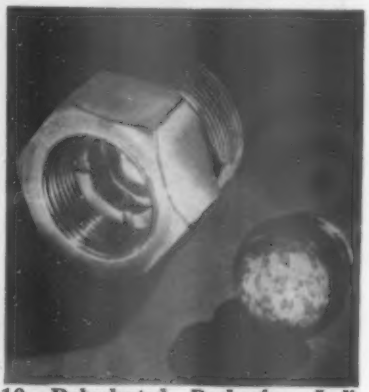
FOR FREE SANITARY SURVEY OF YOUR PREMISES SEE YOUR DOLGE SERVICE MAN

dependable DOLGE

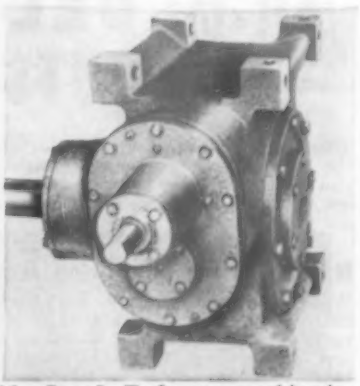
WESTPORT, CONNECTICUT

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.



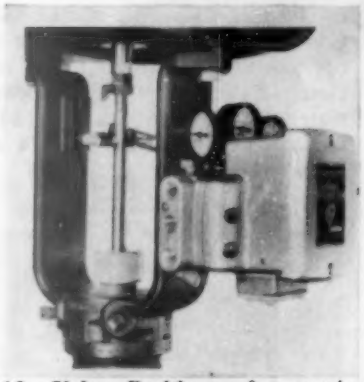
10—Dehydrated Packaging Indicator employs silica gel as a desiccant. Recommended for packaging involving pressure or vacuum, and requiring a visual means of checking relative humidity within container. Unit sealed into metal housing in package. *Davison Chemical Co.*



11—Speed Reducer, combination helical and worm gear, is for overhead, trolley, floor, and pit-type conveyors, etc. Integrates with virtually any drive—can be mounted with output shaft horizontal or vertical, input shaft at horizontal right angle. *Philadelphia Gear Works.*

12—Carboy Pump, hand-operated, transfers all standard-size glass carboys; small quantities of acids, alkalis, other corrosive liquids. Solves problem of interrupting flow at right moment. Completely fabricated of unplasticized polyvinyl chloride. *American Agile Corp.*

For more about these products, circle item numbers on Reader Service card next to back cover.



13—Valve Positioner for precise control uses motion balance principle. Overcomes friction and reduces line effects, speeding valve response to controller signal. For large-volume diaphragm motors, processes where controller-to-valve distances are long. *Foxboro Co.*

14—Pressure Controller is pressure-sensor, control pilot, and control valve in one unit. Micro Delta P Controller provides square-wave pressure response, micro-second control without hunting, constant pressure throughout full flow range. *Industrial Engineering Corp.*

15—Current Transformers, thermo-setting epoxy resin cast, operate meters and instruments in single- or three-phase circuits to 600 volts. Primary and secondary polarity markings are permanently molded to casing. For indoor or outdoor use. *Allis-Chalmers Mfg. Co.*

Turn the page

4-wheel drive does another job better!

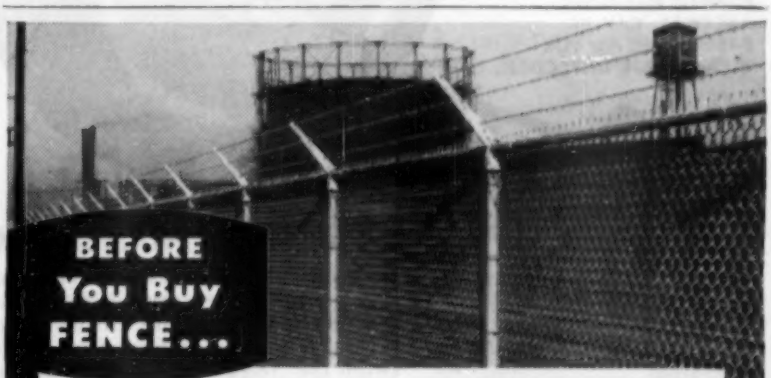
YARD MAINTENANCE

The 'Jeep' Truck with its powerful 6-cylinder engine and 4-wheel drive traction is ready for the most rugged work 365 days a year. Here is a sturdy workhorse that travels at normal highway speeds, and shifts easily into 4-wheel drive for that extra needed traction when the going is tough. With power take-off it operates compressors, generators, welders. The 'Jeep' Truck carries loads of over a ton and hauls trailers many times its own weight. See the truck that spreads its cost over a wide range of jobs. See your nearest Willys dealer or write for information now.

4-WHEEL DRIVE UNIVERSAL **Jeep**® TRUCK

WILLYS...world's largest maker of 4-wheel drive vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO



BEFORE You Buy FENCE...

Get the Facts on CONTINENTAL

The Only— Chain Link Fence made of KONIK STEEL

Konik is a special alloy steel that gives Continental Chain Link Fence *increased rust resistance* for longer life and lower upkeep costs. Its *greater tensile strength* (over 85,000 lbs. per sq. inch) withstands abusive shocks and stresses, extremes of temperature, without sagging or losing alignment. *Bright-galvanizing* after weaving and 13 other features mean extra protection and fine appearance. Complete engineering and construction service.

KONIK STEEL

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CONTINENTAL
STEEL CORPORATION · KOKOMO, INDIANA

PRODUCERS OF: Manufacturer's Wire in many sizes, shapes, tempers, and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, and special wire. ALSO Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

Gentlemen: Please send us without obligation a copy of "Planned Protection."

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Faultless CASTERS

ARE NOT AFFECTED BY STEAM, DIRT, WATER OR BRINE . . . WILL KEEP YOUR PRODUCTION LINES ROLLING

SERIES 900GS CASTER Cut-away to show grease sealed double ball bearing swivel.

1 LEAK-PROOF NEOPRENE RETAINER MOLDED AND VULCANIZED ON UPPER BEARING SWIVEL RACEWAY. PATENT PENDING.

2 THRUST BEARING GREASE RETAINER TIGHTLY FITTED AROUND FORMED, HARDENED RACEWAY. CAN BE EASILY REMOVED FOR CLEANING OR INSPECTION.

3 NEOPRENE RING PERMANENTLY ATTACHED TO METAL WASHER AND PRESS FITTED INTO HUB.

KEEP TRUCKS ROLLING —CUT MAINTENANCE TIME

Here's an industrial caster so efficiently sealed that neither water, dirt, chemicals or high temperatures affect its maneuverability. A permanent film of grease, between the Neoprene vulcanized seal and top-plate, greatly reduces friction—accelerates swiveling—minimizes "down-time" and plant interruptions. Write today for Bulletin 157-3G, no obligation.

Packing house extremes of 0°F-200°F, brine and steam do not affect lubricated bearings of Faultless 900GS Casters.

Freight is loaded faster when permanent Caster lubrication cuts "down-time." No grease can drip, floors are clean and safe. More loads can be moved by one man.

FAULTLESS SOLVES THE TOUGH JOBS

FAULTLESS CASTER CORPORATION

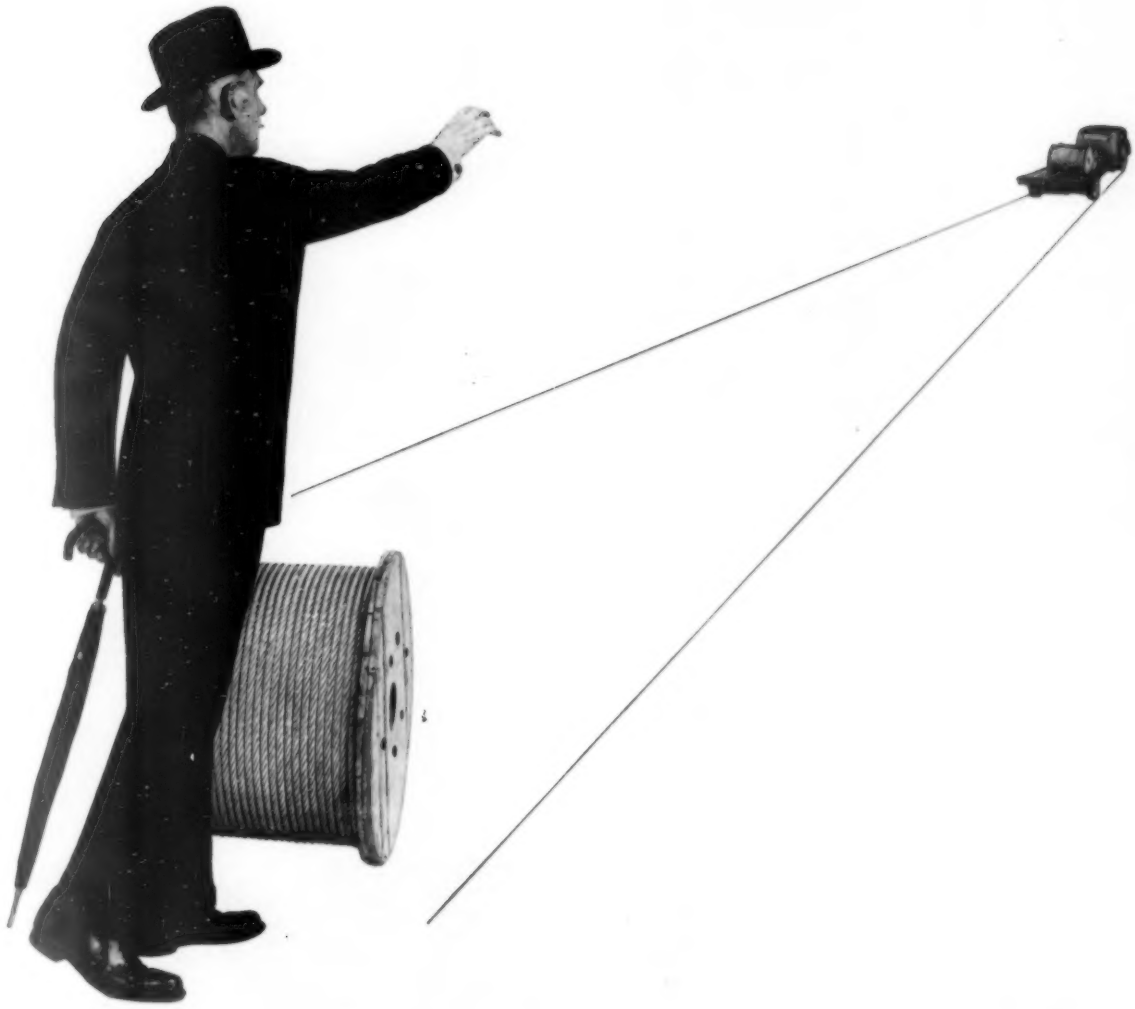
For more about these products, circle item numbers on Reader Service card next to back cover.

16—Vibrating Conveyor, mechanical, handles wide range of materials. Compact, easy to install, simple to operate, quiet. Features totally enclosed, oil-immersed drive. Moves materials to 45 tons per hr. 12-ft. sections, deck widths of 5 to 24 in. *Jeffrey Mfg. Co.*

17—Ridge Oiler solves problem of flooding dies with cutting oil while threading pipe—manually or by power—with hand-die stocks. Catches oil, chips, cut-offs, keeping floors clean and providing endless stream of clean oil. Saves 95% of oil for reuse. *Ridge Tool Co.*

18—Control Center scans and controls temperature of up to 72 stations in a fixed time interval—72 in less than four minutes. Gives visual and audible alarm if any station is "off limits." And indicates amount of correction needed at any point. *Barber-Colman Co.*

Turn the page



YOUR WICKWIRE ROPE DISTRIBUTOR SAVES YOU DOWN TIME

When the lack of the proper wire rope halts your production or your operations, thank your lucky stars that your helpful Wickwire distributor is only a quick phone call away. It's a wonderful feeling...to know you'll be getting exactly what you need from his warehouse stocks in only a few hours time.

Now contrast that with the cost in time, money and inconvenience of emergency shipments direct from a distant manufacturer.

In addition to saving on down time, your Wickwire distributor effects further economies by recommending the wire rope that will give you the longest service life, by minimizing your bookkeeping, inventory maintenance and transportation costs. He keeps your reserve stocks for you so that you don't tie up capital in stand-by materials, warehouse space and unnecessary stock insurance and handling.

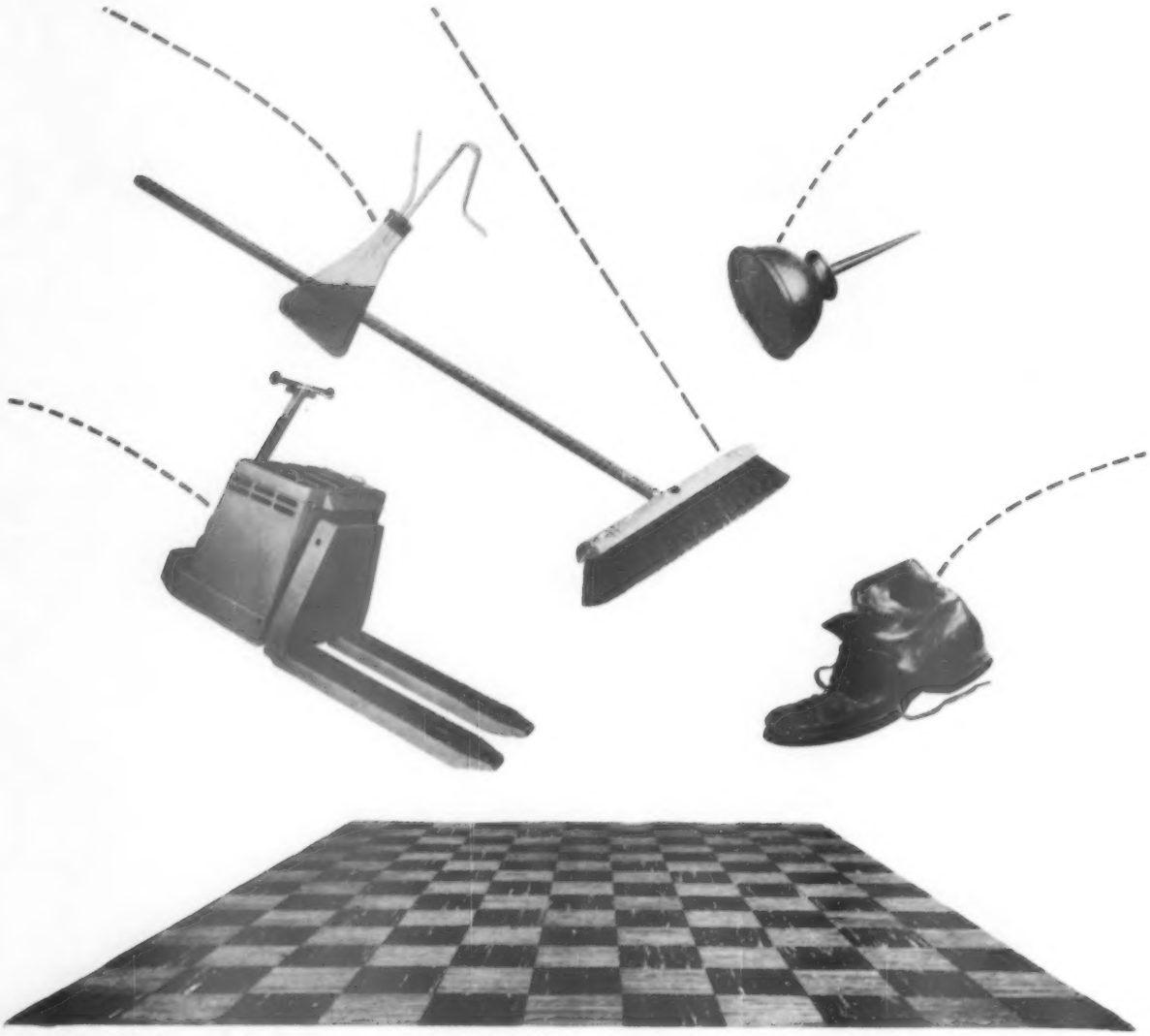
Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

CF&I WICKWIRE ROPE A CF&I PRODUCT

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

3152

... HUBBELL CONTRIBUTES



No matter what's thrown at them...

FLOORS OF **SPECIAL KENTILE**

STAND UP IN SERVICE!

When you want a heavy-duty flooring that can take a lot of punishment, the answer is *Special (Greaseproof) Kentile.*

Special Kentile resists the heaviest foot and wheel traffic, withstands constant exposure to spillage of industrial and cooking oils and greases, most chemicals, adhesives, inks, and alcohols, and comes up bright and shining with a minimum of maintenance care. It is comfortable underfoot, and fire resistant.

When you add the savings that come from low-cost installation to its low maintenance expense, you'll find *Special Kentile* today's best buy for industrial floors. See your Kentile, Inc. Flooring Contractor, or write Kentile, Inc., 58 Second Avenue, Brooklyn 15, N. Y.

SPECIAL GREASE-PROOF **KENTILE**®

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

19—In-Plant Fire Truck carries wide assortment of fire fighting equipment. It's especially adaptable to needs of plant fire brigades. Six models, one featuring 300-lb. dry chemical unit, 150-gal. water fog system. Other systems for various hazards. *Ansul Chemical Co.*

20—Fastening Tool, powder-actuated, may be used for either a ⅜-in. stud or ¼-in. stud with only a simple change of the barrel. Ramset "Duo-Jobmaster" permits on-the-job changeover. Features low recoil, angle fire control, easy maintenance. *Winchester-Western Div.*

21—Rolling Truck Deck turns truck "inside out." Eliminates crawling in and out of truck to get items. Light pull rolls deck to several locking positions or full extension. Bears 1½ tons. Unit that can be removed for preloading will soon be available. *Rol-Loader Corp.*

Turn the page

. . . HUBBELL CONTRIBUTES PRODUCT QUALITY AND PERFORMANCE

HUBBELL
REG. U.S. PAT. OFF.

FACTORY MANAGEMENT AND MAINTENANCE
SIGNIFICANT PLANT OF THE YEAR

Citation

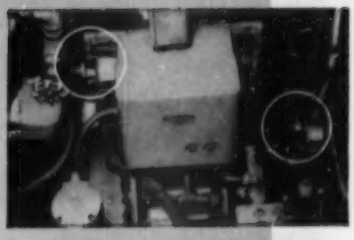
Adamas Carbide
Incorporated
KENILWORTH, N. J.

Chosen by Factory Management and Maintenance from among 500 entries as one of the ten most significant plants of the year. Adamas, foremost in its field for production quality, specified Hubbell wiring devices throughout its plant.

Plant Engineer: MR. GERARD SCHEYER
Electrical Contractor: LIGHTNING ELECTRIC SERVICE, INC. Newark, N. J.
Hubbell Supplier: MONARCH ELECTRICAL SUPPLY CO., INC. Newark, N. J.

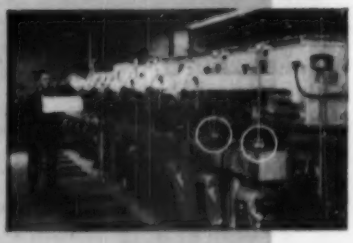
No. 5282

Circled right, Hubbell 5282 3-wire duplex outlet used on auxiliary machine equipment along with 3-wire grounding type rubber cap, No. 5276. Also note use of Twist Lock No. 7417 and 7411 on machine at left



No. 7517

At right, main furnace room at the Adamas plant showing rugged Hubbell Twist Lock units (7517 receptacle and 7311 cap) used in connection with the furnace controls.



No. 7411

Twist Lock units like the 4-wire No. 7411 cap provide a secure, vibration proof and pull proof connection used on test equipment in the Adamas laboratory. Illustration shows 7411 and 7410 receptacle in use.

No. 1201

Quiet, dependable Topper AC switches control the modern fluorescent lighting used throughout the Adamas plant.

SOLD ONLY THROUGH AUTHORIZED ELECTRICAL DISTRIBUTORS

HARVEY HUBBELL, INC.
BRIDGEPORT, CONN.

Dept. P

ANCHOR FENCE gives your plant and grounds DOUBLE PROTECTION!

DAY & NIGHT

Anchor Fence is one watchman that really gives you double protection at no extra cost. It works *twice around the clock* every day —giving you the best in all-round protection and traffic control. It never relaxes, never needs a vacation. And, there's no charge for overtime.

What's more, the orange and black nameplate that says "Anchor Fence" means your chain link fence is the best money can buy—the fence with the zinc coating applied *after* weaving, not before. Exclusive deep-driven "anchors" hold it permanently in line and erect. The design of its square corner, gate and terminal posts eliminate any possible toe or hand holds.

Get more information and a free estimate now. Call your local Anchor Office or write: ANCHOR POST PRODUCTS, INC., *Industrial Fence Division*, 6620 Eastern Avenue, Baltimore 24, Md.

Anchor Fence®

Division of ANCHOR POST PRODUCTS, Inc.

Plants in: Baltimore, Md.; Houston, Texas; and Los Angeles, Calif.
Branches and warehouses in all principal cities.

For more about these products, circle item numbers on Reader Service card next to back cover.

22—Straddle Carrier has load hooks that pivot inward to permit carrying without bolsters. Permanent skids or stringers are needed only at pick-up and delivery points. Pivoting movement hydraulically controlled by lever at left of driver's seat. *Clark Equipment Co.*

23—Power Dumper raises drums, barrels, bags, boxes, trucks, any type container; turns to desired dumping angle; discharges contents without spilling, dripping, or waste into any receptacle, any height. Furnished with operator or automatic control. *Langley Mfg. Co.*

24—High-Pressure Flexible Hose withstands severe surge peaks—5000 psi. in ⅜-in. size, higher pressures in larger sizes, or 15-20% higher than maker's standard high-pressure hoses. ⅜-, ½-, ¾-in. sizes. Two larger sizes take reusable fittings. *Aeroquip Corp.*

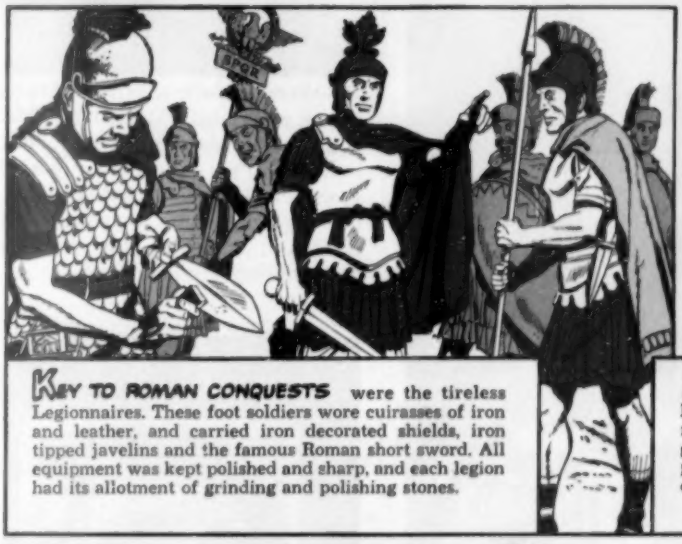
Turn the page

ABRASIVES WERE AN AID TO ROMAN construction and conquest.

NO. 5 OF A SERIES ON THE HISTORY OF ABRASIVES BY CHICAGO WHEEL & MFG. CO.

'The glory that was Rome' is debatable among historians. Surprisingly, Rome is more often remembered for its decline and fall than for its accomplishments. However, all agree the Romans were great builders. Their temples, villas, arenas, and triumphal arches testify to this. In building construction as well as in the weapons of war, abrasives and grinding played a part.

IN THE DAYS of the Empire, the principal building materials were stone, brick and cement. For the more important buildings slabs of marble were laid over the rough structure. The removing of burrs on stone, the smoothing of mortar and the grinding and polishing of marble was done with abrasive rock, sandstone and pumice.



KEY TO ROMAN CONQUESTS were the tireless Legionnaires. These foot soldiers wore cuirasses of iron and leather, and carried iron decorated shields, iron tipped javelins and the famous Roman short sword. All equipment was kept polished and sharp, and each legion had its allotment of grinding and polishing stones.

ABRASIVES were common to the Roman home. Pliny and Lucian wrote of metal mirrors, made of a mixture of copper and tin, which required frequent grinding to enhance their reflective quality. For this purpose a sponge full of powdered pumice-stone was often kept hanging near the mirror.

THROUGHOUT ancient history man depended on muscle power to grind, smooth and polish. Abrasion was a tough, time consuming occupation. The scientific approach to making abrasive wheels today, plus the high speed tools that operate them, have taken the time and labor out of grinding.

A new factor in the manufacturing of mounted wheels and points is Chicago Wheel's positive production control. This means mounted wheels and points can now be produced alike in every detail. There is no variance from one production run to another. In other words, if you used a particular wheel type for a job one month ago and now want another order, the new wheels will be exactly the same. You can imagine the advantage here in production grinding.

CHICAGO WHEEL & MFG. CO.

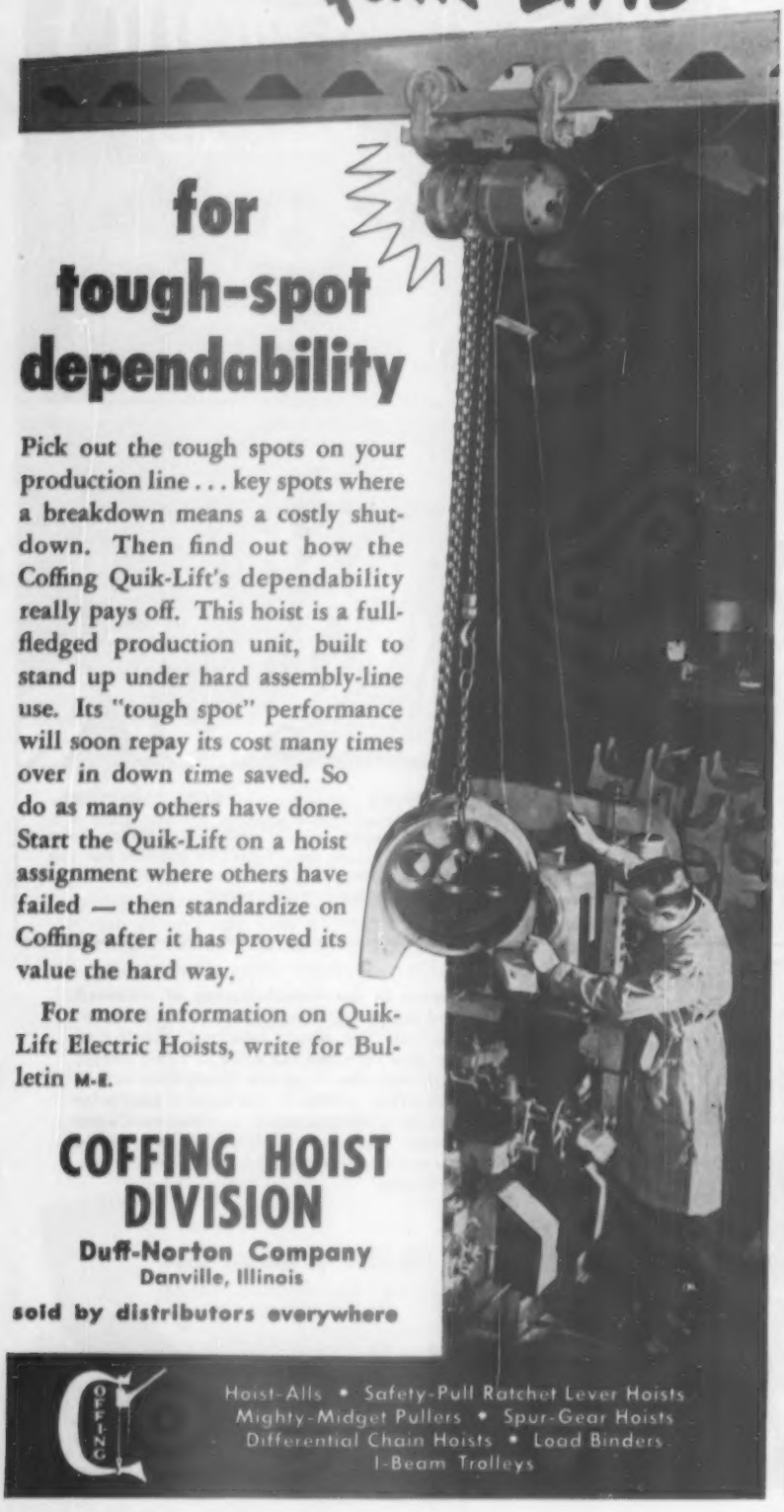
1101 W. Monroe Street, Chicago 7, Illinois, Dept. FM

PROVE TO YOURSELF...

Chicago Wheel's positive production control. Write for test wheels to use in actual production. No charge.

© 1955 • CHICAGO WHEEL & MFG. CO.

use COFFING Quik-Lifts



for tough-spot dependability

Pick out the tough spots on your production line . . . key spots where a breakdown means a costly shutdown. Then find out how the Coffing Quik-Lift's dependability really pays off. This hoist is a full-fledged production unit, built to stand up under hard assembly-line use. Its "tough spot" performance will soon repay its cost many times over in down time saved. So do as many others have done. Start the Quik-Lift on a hoist assignment where others have failed — then standardize on Coffing after it has proved its value the hard way.

For more information on Quik-Lift Electric Hoists, write for Bulletin M-E.

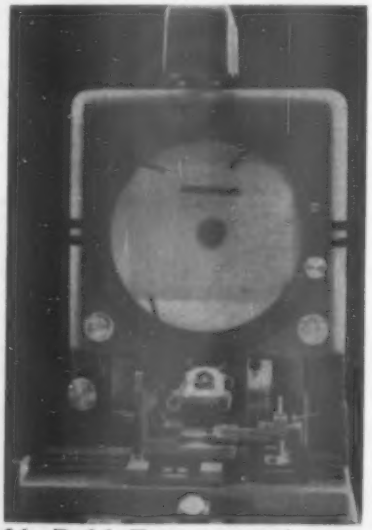
COFFING HOIST DIVISION
Duff-Norton Company
Danville, Illinois
sold by distributors everywhere

Hoist-Alls • Safety-Pull Ratchet Lever Hoists
Mighty-Midget Pullers • Spur-Gear Hoists
Differential Chain Hoists • Load Binders
I-Beam Trolleys

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

25—Panel is made of expanded metal lath embedded in layer of fibrous glass impregnated with polyester resin. Ideal for glazing security windows; small, unsupported skylights; housing dangerous equipment (as pictured); screening for privacy, dust-proofing. *Resolite Corp.*



26—Reticle Tracer accurately gages many parts too difficult for inspection on contour projectors. Only outline of part is projected, not part itself. Projection is independent of part size; may be magnified. Tracer explores configurations of part. *Optical Gaging Products, Inc.*

Turn to page 168

Short cuts speed printed-circuit design at Brush Electronics Co.

"3-day job"...done in 3 hours

Brush Electronics Co., a Division of Clevite Corp., Cleveland, Ohio, finds countless uses for photographic materials and techniques in designing more than 700 products.

Take the draftsman working on that printed-circuit diagram, for example. The original practice was to draw such circuits in ink on heavy Bristol board.

Now, the job is done in a fraction of the time by positioning precut circles and lines, with adhesive backing, on a form. This is reproduced on Kodagraph Autopositive Film, a positive copy being obtained directly without a negative step. This reproduction—with dense black photographic lines on a translucent base—is sent to the vendor who makes the printed circuits.

Brush has also found that duplicate tracings, made quickly and economically on roomlight-handling Kodagraph Autopositive Paper or Film, are the key to further savings when drawings must be revised, or vendor prints reproduced. Such duplicates are continually being used in place of originals for reference and print making . . . are protection against possible loss or unavailability of the originals.

And Brush further streamlines drafting and engineering activities with the help of other Kodak materials—uses Kodagraph Contact Fine-Line Paper for revising and combining drawings, and making high-quality offset plates . . . uses Kodalith Film in preparing "pictorial" assembly drawings, reduced-size drawings, handbook pages, graphs. *Sometimes four or five materials are used on one job, for top-quality results and savings at every step.*

To learn the ways Kodagraph and other Kodak reproduction materials can serve you, just mail coupon below, or get in touch with your local blueprinter.

Kodagraph Reproduction Materials

New booklet is jam-packed with valuable tips on saving drafting time, protecting drawings, getting better prints.

MAIL COUPON FOR FREE BOOKLET

EASTMAN KODAK COMPANY
Graphic Reproduction Division, Rochester 4, N. Y. 17
Gentlemen: Please send me a free copy of your new booklet on Kodagraph Reproduction Materials.

Name_____ Position_____

Company_____

Street_____

City_____ Zone_____ State_____

Kodak

The National Merit Scholarship Corporation

Business is Offered Big Dividends on Investment in Higher Education

The McGraw-Hill Publishing Company is availing itself of the opportunity to establish ten National Merit Scholarships. They will be known as the McGraw-Hill Merit Scholarships. The scholarships are to be awarded to qualified candidates for a four-year college course in the fields of science, engineering and the other professions and the liberal arts. There will be no limitation, beyond the appropriate professional accrediting, on the college or university selected by a successful candidate. As part of a continuing program to aid higher education and educational institutions, McGraw-Hill is happy to be able to share in what it believes to be the constructive educational endeavor of the National Merit Scholarship Corporation.

Business firms searching for a satisfactory avenue to provide financial aid for our colleges and universities now have a new opportunity of major importance. It is provided by the National Merit Scholarship Corporation, which has offered to devote $8 million to matching, dollar for dollar, gifts by business firms for college scholarships and supplemental gifts to the institutions where the scholarships are used.

The National Merit Scholarship Corporation, an independent agency financed initially by gifts of $20 million from the Ford Foundation and $500,000 from the Carnegie Corporation, has three major purposes which are closely related. They are:

1. To locate those of the nation's young men and young women who are best equipped to go to college.

2. When necessary, to help these young people go to college by giving them financial aid.

3. To help colleges and universities meet the full cost of the instruction of those to whom National Merit scholarships are granted.

At present about half of the nation's top high school graduates do not go to college. The principal reason is that they do not have the money required.

To Save Unused Brain Power

The National Merit Scholarship Corporation will strive to eliminate this dangerous neglect of top-flight ability. To this end it is inviting the nation's high schools, numbering more than 24,000, to participate in its program by designating as available candidates for National Merit scholarships the top 5 percent of their senior classes. Those so designated are then invited to take a series of tests and to submit reports designed to assure selection of the very best talent in each state. The number of scholarships to be allotted to each state will be proportionate to the number of high school graduates in the state.

The winners, the total number of whom will be determined by the amount of money the Scholarship Corporation has available, will be eligible for awards. For those who need no financial help to go to college there will be honorary awards of $100. For those who must have help the Corporation will grant scholarships covering as much as necessary

of the cost of instruction and living expenses for a four-year college course.

Colleges Get Financial Help

The provision of funds to cover the students' expenses does not, however, solve the financial problems faced by many colleges. That is because the tuition charges paid by the students do not cover the cost of the instruction. The deficit must be met by drawing upon endowment funds, gifts, grants, and other available sources.

Consequently, to prevent holders of National Merit scholarships from imposing any additional financial burden on the colleges and universities they elect to attend, the Corporation will make a supplementary grant to these institutions. The supplementary grant will be the equivalent of regular tuition charges made by the school, with a top limit of $1,500 a year for both the tuition and the supplement.

As the scholarship grants to the winning students will vary, depending upon how much financial help they need, so will the supplementary grants vary from one college to another, depending on their regular tuition charges. However, it is anticipated that on the average the full cost of a National Merit scholarship—including aid to the student and the supplement to the college—will be about $1,500 a year.

Many business firms will find a compelling appeal in a program which is designed at once to mobilize the nation's intellectual resources more effectively and, in the process, give very badly needed financial help to our colleges and universities.

Two For One Return Offered

However, there are numerous other inducements to business firms to finance National Merit scholarships. These scholarships may:

1. Carry the name of the firm or be named in honor of someone designated by the firm.
2. Be limited to use in types of colleges of particular interest to the sponsoring firm.
3. Be limited to a college course, such as science, engineering or liberal arts, of special concern to the sponsor.
4. Be restricted to candidates or institutions in geographic areas specified by the sponsor.

In addition to these advantages there is a special financial inducement to help the Merit Scholarship program. It is that for every Merit scholarship a firm or individual finances, the Corporation will, up to the limit of $8 million, match the funds and make another National Merit scholarship available.

There are many good ways of helping our financially beleaguered colleges and universities, and many corporations are already using one or more of them.* For those companies that can do so without embarrassing complications one of the best ways is to make unrestricted gifts directly to the institutions. But this new way provided by the creation of the National Merit Scholarship Corporation (Address: 1580 Sherman Avenue, Evanston, Illinois) has the broad appeal of serving two purposes of transcendent importance simultaneously. The purposes are to see that our best brains are fully trained and utilized and that our colleges and universities, crucial contributors to this process, are helped at the same time. Business will serve the nation and its own community well by giving the National Merit Scholarship Corporation generous help.

---

* These, as well as the plight of our colleges and universities, are discussed in a pamphlet, "Business Aid to Our Colleges and Universities," which embodies a series of five editorials which appeared in all McGraw-Hill publications. Copies of the pamphlet can be obtained without charge by addressing the Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, New York.

Methods of helping our colleges and universities financially are also outlined and discussed in a pamphlet, "Aids to Corporate Support of Higher Education," which may be obtained without cost by addressing the Council for Financial Aid to Education, 6 East 45th Street, New York 17, New York.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

DO YOUR SCALES ADD UP TO A *Weighing System?*

TODAY IT PAYS TO TAKE A PLANT-WIDE LOOK AT WEIGHING

Do you have the *right* scales in the *right* places? A modern *Weighing System* works hand in hand with your accounting *system* and makes a *big* difference in helping you win your war on costs. Weight records that originate at scales flow to the accounting areas and directly affect costs, inventories and customer billings. Weighing errors cannot be corrected later—weights must be right the *first* time. That's why it's more than ever important to think of weighing not in terms of isolated scales, but as a vital part of your overall cost-control system.

If you would like to explore this in relation to your plant, why not drop us a line today? No obligation, of course.
Ask about the "weighing system plan."
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COUNT by WEIGHT
Control costs better. These new Counting Scales eliminate slow, tedious hand counting of parts . . . count hundreds of parts *accurately* in a few seconds! Complete line—for issuing pre-determined quantities . . . counting unknown quantities . . . or to get accurate receiving, shipping, and piece-work counts. Send for booklet.

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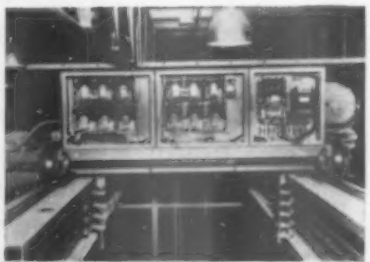
HEADQUARTERS FOR SCALES

For more about these products, circle item numbers on Reader Service card next to back cover.

27—Plug-In Panelboard features breakers with right-angle "Swingrip"' mounting. Assures proper positioning; firm, positive connection in one easy, natural operation. For a-c lighting, appliance branch circuits. With main lugs only, or main breaker. *Square D Co.*

28—Compressor is for high-pressure, high-capacity compression of air or gases. Pair of positive-displacement, axial-flow blowers work in two stages to boost discharge pressure 15-50 psi., up to 125 psi. 100-4000 cfm.; 15-600 hp. Oil-free delivery. *Read Standard Corp.*



29—Crane Control converts infrequently used cranes from cab to pendant operation. Trolley, bridge, and hoist controls can be mounted individually or in group. Less expensive and lighter components are front-mounted and wired on steel panel. *Westinghouse Electric Corp.*

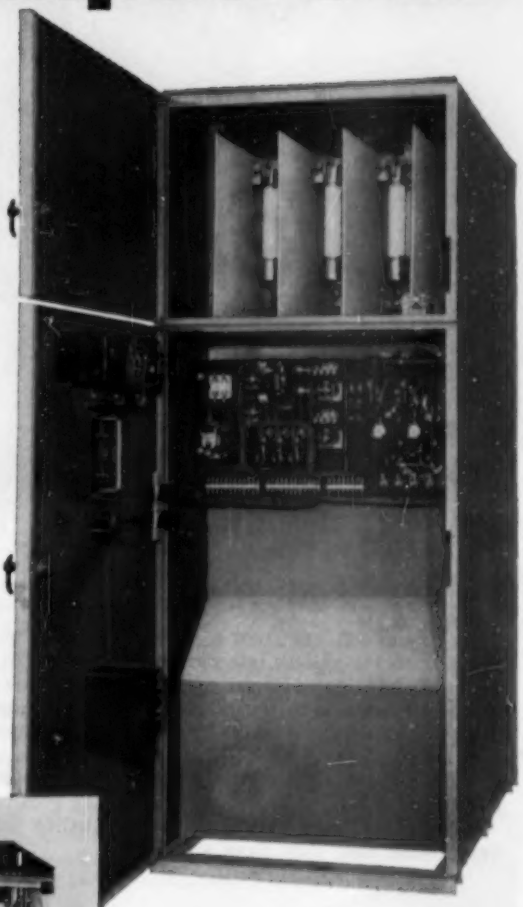
Turn the page

Complete "Line-to-Load" MOTOR Control and Protection in ONE Compact Unit

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

THE Allis-Chalmers Type H high voltage starter is a complete control unit. Everything needed for efficient motor control and positive protection is engineered into one easy-to-install cubicle.

Control functions, varying with specific job applications, include full or reduced-voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.



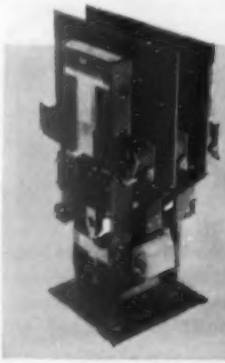
A few of the many protective features

Current-Limiting Fuses clear short circuit in less than ½ cycle . . . long before short can damage contactor or motor.

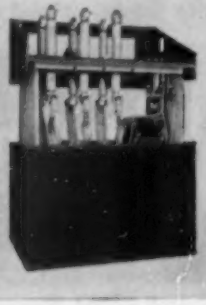
Overload Thermal Relay adjusts for ambient temperatures . . . trips only on motor overload. Allows use of maximum capacity.

Time-Delay Undervoltage Relay permits restarting if power is restored within its setting.

Compartmented Enclosures isolate high voltages. Dead front construction and electrical interlock on fuse compartment provide additional personnel protection.



Choice of Air or Oil Contactors



For complete information, see your Allis-Chalmers representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

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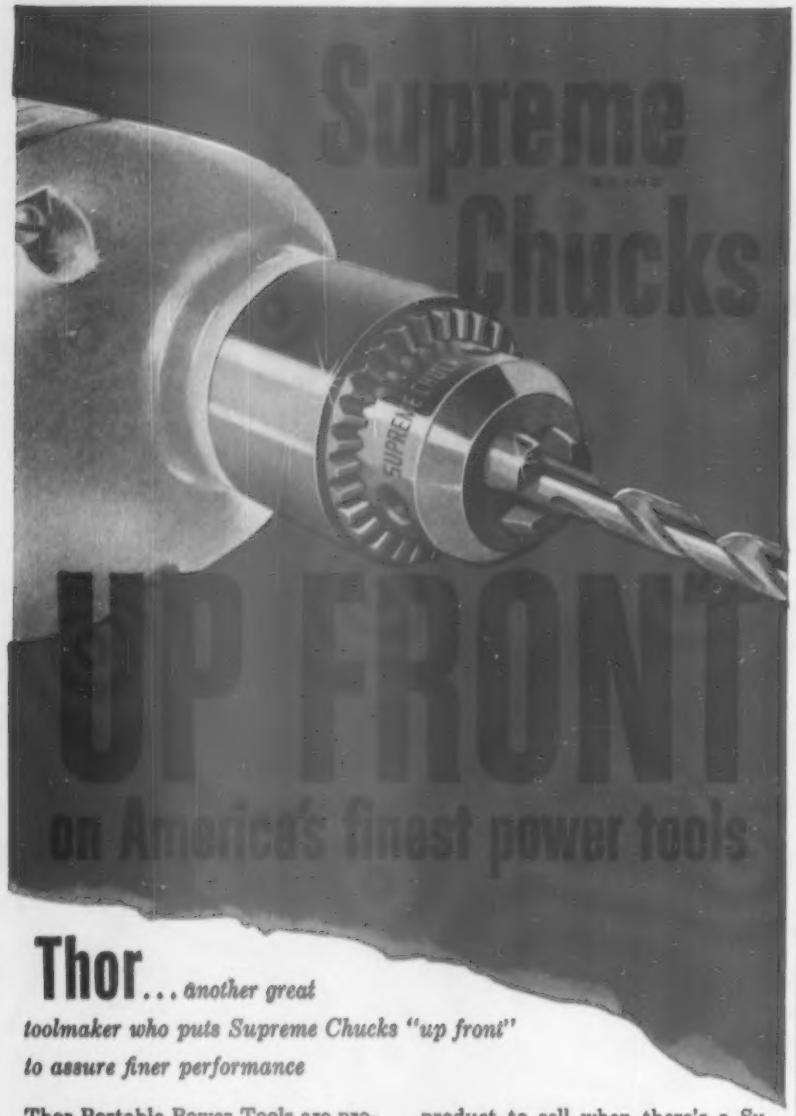


Thor... *another great toolmaker who puts Supreme Chucks "up front" to assure finer performance*

Thor Portable Power Tools are produced with the sincere intention of giving America's tool buyers the finest performance qualities possible. With this in mind, the management has elected to equip more and more of their output with Supreme Brand Chucks.

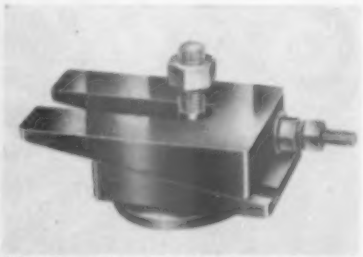
Thor, like other power tool makers, have found that they have a finer product to sell when there's a Supreme Chuck up front. Tool buyers everywhere will do well to follow the leaders and specify Supreme on new tools—insist on them for all replacement use.

An industrial distributor near you can give you the full story on extra quality Supreme Brand Chucks.

SUPREME PRODUCTS, INC. • 2222 S. CALUMET AVE., CHICAGO 16, ILL.

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.



30—Leveling Block of cast iron is bolted to machine leg; compensates for uneven floors by semi-automatic adjustment. Corrects out-of-line shaft wear. Socket pivoting plate is self-aligning up to 2-deg. angle. Four sizes for weights to 10,000 lb. *Gy-a-liner Mfg. Co.*

31—Pneumatic Silencers eliminate noise, shock from air-operated equipment. All-metal units reduce sound to 75 decibels. "Quietaires" have no cartridges, no parts needing replacements. Compact, easily attached. Four models to fit practically all equipment. *C. W. Morris Co.*

32—Ultrasonic Solder Gun has heating coil within transducer. Delivers heat to working tip via second power line contained in one-cord set. Eliminates need for cumbersome heating devices to flow the solder. 3-in. solder pot also available. *Alcar Instruments, Inc.*

Turn the page

How freezing hardens the business end of a pen

Sales curves for ball-point pens continue to swing upward partly because the business end—the ball tip—does its job so well. The tiny ball is corrosion-proof so it won't jam, perfectly round for smooth writing and extra hard to resist wear. Winsted Bearing Corporation, Winsted, Connecticut, uses refrigeration and air conditioning in the manufacture of these miniature bearings.

Bearings are made of stainless steel to avoid corrosion. They are hardened to a hardness approaching that of carbon-alloy steel after heat treating in a freezing alcohol bath of below -100°F. An industrial refrigeration cabinet charged with Du Pont "Freon"* refrigerant is used in this stabilization process.

To assure perfect roundness, each ball-point bearing is run through a gauging machine before shipment. The inspection department is air conditioned to eliminate minute size variations due to temperature changes and to aid the efficiency of inspectors, regardless of outside temperatures.

Modern refrigeration and air conditioning with "Freon" refrigerants has solved many production problems. "Freon" refrigerants are ideal for industrial service, because they are nonflammable, nonexplosive, and virtually nontoxic. For nearly 25 years Du Pont has been manufacturing "Freon" to exacting laboratory standards—insuring top quality and uniformity.

Perhaps refrigeration and air conditioning can help you improve quality and cut costs. You will find profitable information in the Du Pont booklet "How Air Conditioning and Refrigeration Benefit Industry." Clip out and mail the coupon below. See what air conditioning and refrigeration can do for you.

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"FREON"

SAFE REFRIGERANTS

**"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants.*

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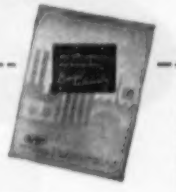
Better Things for Better Living . . . through Chemistry



E. I. du Pont de Nemours & Co. (Inc.), Room 2420
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Please send me the booklet "How Air Conditioning and Refrigeration Benefit Industry."

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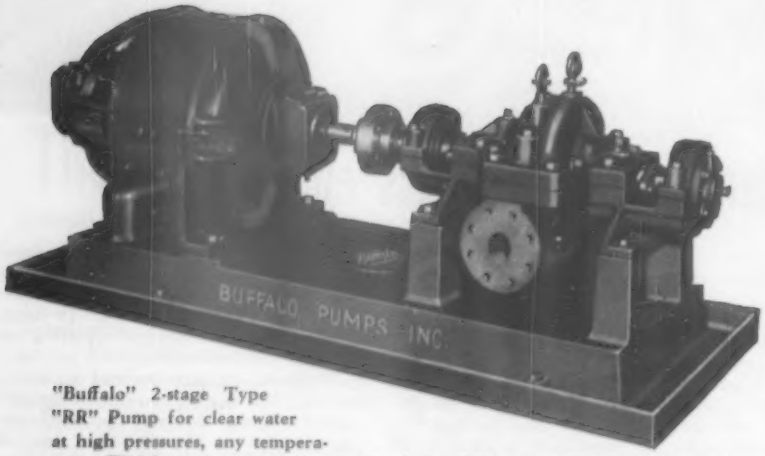
1012

You're Actually Buying Low-Cost G.P.M.'s!

Put your pump buying on a basis of *overall costs*, for a true picture of what's the best buy! You're actually buying *delivered gallons*, over the life of the pump. How long the pump lasts—how efficient it is—how much it costs to maintain—are all factors that figure in your cost per delivered gallon.

Users of "Buffalo" Type "RR" Multi-stage Pumps have continued to enjoy low-cost gpm's, millions of gallons after installation. This is because of their inherent high efficiency, (which keeps your driving power requirements to a minimum) and simple, oversize construction (which keeps maintenance costs rock-bottom) the "Q" Factor* which has been engineered into every "Buffalo" product for the past 78 years. It will pay you to write for Bulletin 980 and see why an "RR" is bound to give you low-cost gpm's in the long run!

NOTE: The "Buffalo" Pumps line is complete! There's a design for almost any liquid you may handle, under a wide range of hydraulic conditions. Let us know your problem—we'll mail you literature on the right pumps!



"Buffalo" 2-stage Type "RR" Pump for clear water at high pressures, any temperatures. Widely and successfully used on boiler feed for many years. 2 and 4 stage models to deliver up to 900 gpm at heads as high as 1500'. Bulletin 980.

"Buffalo" PUMPS

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

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471 BROADWAY BUFFALO, N.Y.

Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

FACTORY / EQUIPMENT NEWS
Begins on page 154

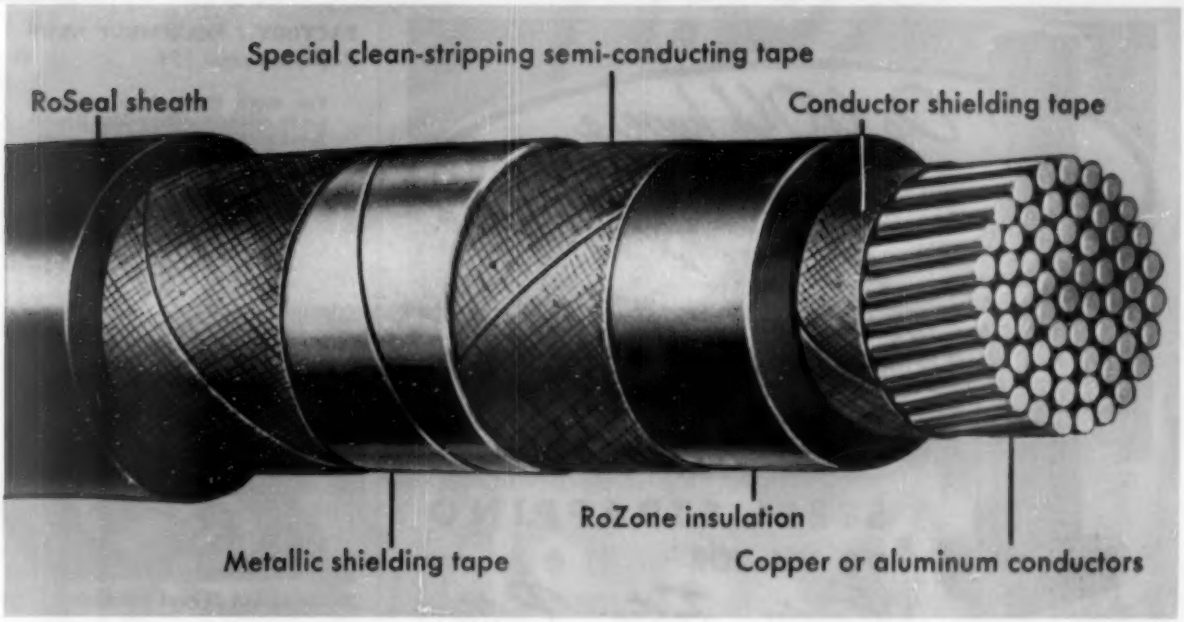
For more about these products, circle item numbers on Reader Service card next to back cover.

33—Mobile Crane features live hydraulic boom, completely self-propelled. Boom topping actuated by 7-in. ram allows extension to height of 27 ft. in seconds. Hoisting speeds range to 100 ft. per min.; are reversible. 5-, 7½-, 10-ton capacities. *Mercer-Robinson Co.*

34—Magnetic Separator is suspended above conveyor belt, chute or sorting table. Removes tramp iron and automatically discharges it on cleated endless belt away from flow of material. Eliminates frequent magnet inspection and hand cleaning. *Stearns Magnetic, Inc.*

35—Portable Lubricator, self-propelled and self-powered, provides lubrication anywhere in plant. Turning radius of 33 in. assures easy positioning. Three heavy-duty hose reels; 25 ft. of hose for reaching out-of-the-way fittings; three 120-lb. drums. *Aro Equipment Corp.*

Turn the page



RoZone-RoSeal shielded power cable for high-voltage applications through 15 kv

What this new high-voltage construction gives you

Informative answers to operating questions about Rome's new non-metallic sheath, RoSeal, as applied over oil-base RoZone® insulation.

Q. What is RoSeal?

A. It's Rome Cable's trade name for a special flame-resistant polyethylene compound, presently recommended as a nonmetallic sheath for rubber-insulated, shielded power cables rated up to 15 kv.

Q. What are some of the important operating advantages of RoSeal?

A. 1. Exceptional moisture resistance.
2. Resistance to weathering and soil conditions.
3. Easy pulling (RoSeal's coefficient of friction is much lower than that of any other sheathing material because of its waxy structure).
4. Good abrasion resistance.
5. Durability and long life.
6. Easy bending and installation at sub-zero temperatures.
7. Good resistance to crushing and impact (mechanically equivalent to Neoprene).
8. High resistance to chemicals and oils.
9. Inherently high corona levels on finished cable.
10. Low cost as a sheath for shielded rubber-insulated power cable.

Q. What experience is there on RoSeal?

A. Rome Cable initiated development in 1949 and began commercial usage over 2 years ago. There are now satisfactory installations in utilities, chemical plants, oil refineries and industry. The performance of a well-known similar sheath used on millions of feet of paper telephone cable for the last 7 years—in the air and underground—has been outstanding. RoSeal is similar to this sheath *except* that flame resistance has been incorporated.

Q. Where can you use RoSeal sheathed cable?

A. Use it in virtually *any* location—in the air, conduit, ducts, direct in earth, or even in water.

Q. How do you splice RoZone-RoSeal power cable?

A. Installation procedure is the same as with Neoprene sheathed cable except that you use a thermoplastic tape in place of Neoprene tape, since RoSeal is a thermoplastic.

For detailed specifications on RoZone-RoSeal write today for Bulletin ROT-1.

See us at the 7th National Plant Maintenance and Engineering Show, Convention Hall, Philadelphia—January 23 to 26, 1956

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
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The Tool Division of Hubbard & Company, Pittsburgh, Pa., manufacturers of railroad maintenance tools, wanted to pack four sledge hammers in one bundle, yet keep container needs to a minimum for economy's sake. Another requirement was protection of the hammer heads' bright finish, which has sales appeal value. Here, another difficult packing job was made easy by using Stanley Steel Strapping.

The heads of the four hammers are encased in a "semi-carton" and bound in place by two bands of ½" Stanley Steel Strapping, applied with the Stanley ACE Strapping Tool. *Four* hard-to-pack products become one compact, secure and economical package.

The Stanley Steel Strapping Specialist has ideas that will improve *your* materials handling operation. He'll *prove* that Stanley has steel strapping hand and power tools that will pack *any* product easier, faster, safer.

Mail coupon today for free Catalog and to arrange an obligation-free appointment.

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STANLEY TOOLS • STANLEY HARDWARE • STANLEY ELECTRIC TOOLS
STANLEY STEEL STRAPPING • STANLEY STEEL

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

36—Cut-Off Wheel for foundry applications features new bonds and bonding processes that permit increase in abrasive grain content, porous construction. Result is sharper, faster cutting action, greater strength. Many grits, grades, sizes. *Bay State Abrasive Products Co.*

37—Drum Tilter is for pouring from rubber drums used for chemicals and solvents. Controlled pouring eliminates spillage and waste. Easy to load, lightweight. Non-slip clamp. Fits 13-gal. capacity drums; may be furnished for other sizes. *Nutting Truck & Caster Co.*

38—Adjustable Speed Motors, a-c, have no external devices for varying speed. 0-2400 rpm. stepless control, with approximately constant torque. For variable-load conveyors, automatic stokers, chemical processing, metalworking, etc. ½-75 hp. *ACEC Electric Corp.*

Turn the page

What a fight against time Santa used to go through
On the night when his Christmas deliveries were due!

Here's the dependable way he now beats the clock:
Swift ***RAILWAY EXPRESS*** *helps in moving his stock!*

The big difference is

Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air—you'll find it pays to specify Railway Express. It makes the big difference in speed, economy, and safe, sure delivery.

• • •

Railway Express uses the facilities of some 480 independent and competitive transportation companies in the movement of express traffic. It's free enterprise at its best, putting at your service one-third of a million miles of co-ordinated rail, air, water, and truck routes that connect all America.

RAILWAY EXPRESS AGENCY

...safe, swift, sure

DAGE "AN EXTENSION OF HUMAN VISION"

A compact DAGE TV camera installation is used in the accounting division by the Towson National Bank, Towson, Maryland.

Records immediately appear on DAGE TV screen at a distant teller's location.

DAGE CLOSED-CIRCUIT TV

speeds up office work

DAGE closed-circuit TV answers business' need for fast, reliable transmission of important information from one department to another. Almost any kind of record can be seen by a DAGE TV camera in one area and immediately transmitted to another floor or building.

Valuable time is saved . . . errors are avoided . . . and reduced operating costs make the low-cost installation of DAGE TV soon pay for itself.

DAGE TV saves time and money in many businesses and industries. Whatever your business . . . write, wire or phone for free booklet: Dept. MM-3, DAGE TELEVISION, Michigan City, Indiana . . . Michigan City 3-3251.

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DAGE TELEVISION DIVISION
Michigan City, Indiana

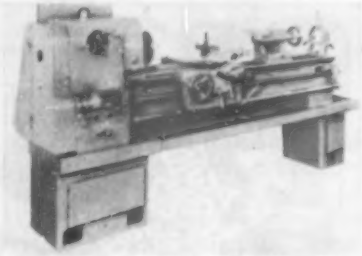
'A Thompson Product'

IN CANADA DISTRIBUTED BY ROGERS MAJESTIC ELECTRONICS, LIMITED, TORONTO, ONTARIO

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

39—Oily Water Separator recovers oils and greases from plant waste, reclaims special process oils from water dowsing and quenching, treats cooling and circulating waters oil-contaminated from breakdowns; does many other jobs. Capacity: 250 tons per hr. *Norwalk Tank Co.*



40—Lathe is for production, maintenance, toolroom. All-geared head, Model LE "Tray-Top" provides 12 spindle speeds with 3-lever, direct-reading shift. 48 thread and feed changes with quick-change gear box. Sizes: 10, 12½, 15, 18 in. *Cincinnati Lathe & Tool Co.*

41—Fork Truck, 5000-lb. capacity, is compact, highly maneuverable. Features short length, narrow width, easy steering, turning radius of 79 in. Weight of 7110 lb. permits operation on lightweight floors. Has gas engine; diesel, LP conversion optional. *Hyster Co.*

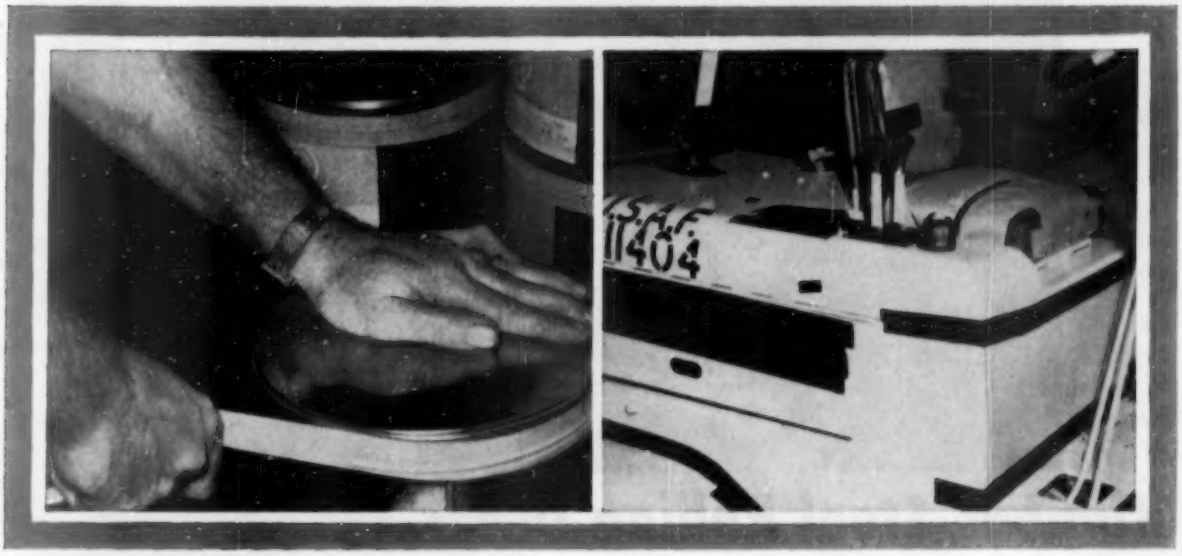
42—Pressure-Sensitive Tape of black production-grade cloth is designed to replace friction tape. No. 64 sticks better to its own backing and application surfaces; has twice as much insulating resistance, although thinner; easier to unwind. *Permacel Tape Corp.*

Turn the page

Polyken TAPES

CONTROLLED STRENGTH

KEEP PRINTING INKS MOIST, LIFT TRUCKS DRY



Here you see *Polyken* Tape being used in two different applications—each requiring a dependable, low-cost moisture barrier.

The cans of printing ink at the left are sealed to prevent the ink from drying out. The tape also protects the contents from dust and keeps the tops secure during rough handling and shipping. The durable cloth-backing of *Polyken* permits repeated use of the tape.

The lift trucks in the other picture—scheduled for overseas shipment—have a waterproof seal of *Polyken* Tape for protection against salt water damage.

In both cases, the ease of applying *Polyken* Tape right from the roll saves many man-hours. And because *Polyken* Tape *stays put*, less is needed for an efficient seal.

These cost-cutting advantages result from *Polyken controlled strength*—the right combination of backing and adhesive to do the best possible job *with the least possible tape.*

Whether your need involves sealing; protection in storage and shipment; wrapping and packaging; or a special requirement—you can depend on Polyken *Controlled Strength* Tapes.

Get complete information by sending the coupon.

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Please send me physical properties and further information on *Polyken* Controlled Strength Tapes.

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Street Address_____

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Newest John Wanamaker Store

Architects: WALLACE and WARNER
Philadelphia, Pa.

Cuts Cost of "In-And-Out Handling"*

with

Kinnear Steel Rolling Doors

* "In-and-out handling" is involved wherever merchandise or materials must be *moved through doorways*—in shipping, receiving, warehousing, processing, or production scheduling. It takes a *continuous* bite out of profits if door equipment isn't of highest efficiency.

That's why, along with such time-savers as loading platforms that adjust quickly to any level, this newest John Wanamaker store features Kinnear Steel Rolling Doors.

You see one of these doors in action above. Note that it opens and closes *straight up and down.* Merchandise stacked door-high *or higher, only an inch or two inside or outside the door,* won't hamper its operation.

The door coils compactly *above* the opening, out of the way and safe from damage. Wind can't slam it shut or bang it back and forth.

When closed, Kinnear Rolling Doors give all-steel protection against wind, fire, weather, theft, and vandalism.

Heavy galvanizing (1.25 ounces of pure zinc per square foot, ASTM standards) gives the rugged steel curtain extra resistance to corrosion.

In addition, a special Kinnear Paint Bond makes field-applied finishes cover better and adhere longer.

In industrial and commercial applications alike Kinnear Rolling Doors offer "more, for less, for longer".

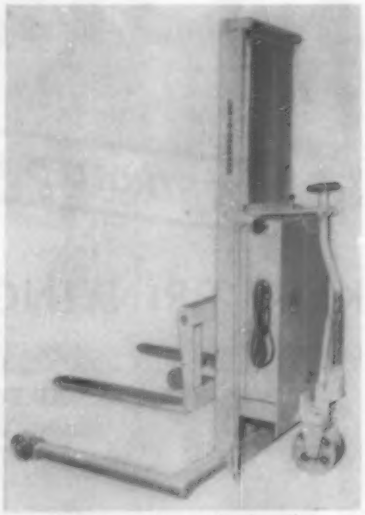
Built any size, for old or new construction, with motor, manual, or mechanical operation. *Write for information on any door need.*

The KINNEAR Manufacturing Company

KINNEAR ROLLING DOORS — Coiling Ways / Rolling Ways

FACTORIES:
1540-60 Fields Avenue, Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
Offices and Agents in All Principal Cities

For more about these products, circle item numbers on Reader Service card next to back cover.



43—Stacker, electro-hydraulic, can also be used as lift truck. As stacker, handle locks upright; as lift truck, handle is used in pulling position. Lifting height is 58 in.; handles pallets 48x48 in. Platform or straddles; 1000 lb. capacity. *Lewis-Shepard Products, Inc.*

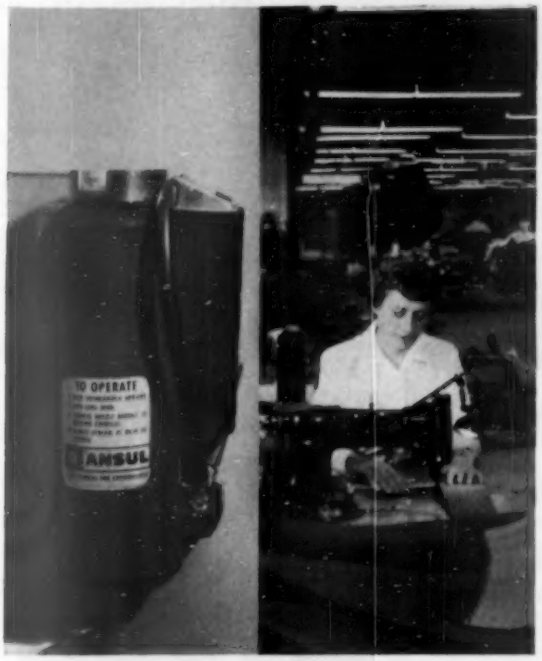
44—Speed Control is made in three types: for continuous, automatic regulation over narrow speed band; as governor-control of dual, predetermined minimum-maximum speeds over greater speed band; to govern single high or low speed. *Torq Engineered Products, Inc.*

45—Sheet Metal Corner Pads are inexpensive, pressure-sensitive cushions designed to prevent costly scratching and gouging of finished surfaces during shop handling. Two sizes are supplied in rack-size rolls that are partially scored for easy separation. *By-Buk Co.*

Turn the page

New multi-purpose 10 lb. Ansul Extinguisher

can simplify your fire protection problem



Lightweight, easy-to-operate Ansul 10-pounder gives fast, effective results even when used by women employees.

The 10-pounder stands up under rugged road use." Built to give dependable service after extreme exposure. Listed by Underwriters' Laboratories.

New rugged unit gives you high fire killing rating, light weight, modern design

The new Ansul 10-pounder is *designed* and *constructed* for all-around plant use—wherever dry chemical protection of this capacity is called for. It is ideally suited for truck protection, other outdoor hazards and indoor use. This multi-purpose advantage means that you have fewer models of extinguishers to service and a less complicated training program to maintain.

The high fire killing rating (B1, C1) of this unit gives you *effective* protection the *instant* it's needed. Another advantage of the Ansul 10-pounder is its light weight. This feature is important where women are called upon to lift and operate the unit. This extinguisher is also modern in appearance. It was styled by Raymond Loewy to be *seen* in any location—in the office, laboratory, plant, or on a truck.

Have the Ansul Man review your class B and C hazards, those involving flammable liquids, gases, and electricity. He will show you how the Ansul 10-pounder can make your fire protection program easier to administer, more economical to maintain.

Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-75, Marinette, Wisconsin. *Write Ansul for your copy of new Fire Equipment Catalog.*

ANSUL

THE *Standardaire*® *Blower*

Moves more gas or air, with less wear...

... and less maintenance and power costs than other blowers of equal weight and size.

You'll find the *Standardaire* Blower offers you a wider range of pressures with a minimum of internal losses, because the *Standardaire* employs a proved principle of compressing gas or air on a modified adiabatic cycle.

The rotors of the *Standardaire* Blower are accurately machined to very close running tolerances, and provide continuous sealing throughout the entire length of their engagement. Therefore, the high pressure gas or air is confined at the discharge end of the Blower and leakage lines are much shorter than on other types of blower units.

Get all the facts today . . . write

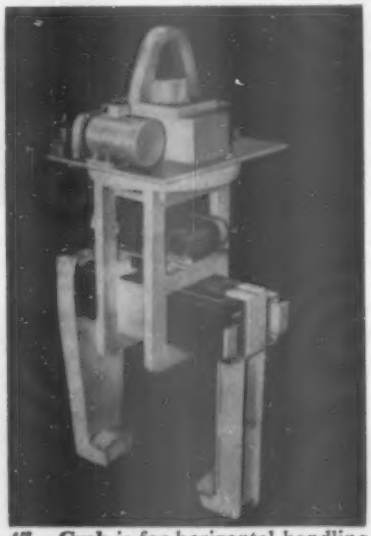
READ STANDARD
CORPORATION

BLOWER-STOKER DIVISION
370 Lexington Avenue
New York 17, New York

Read Standard also manufactures a complete line of chemical mixers for laboratory and industrial use. For information write, Read Standard Corp., York, Pennsylvania

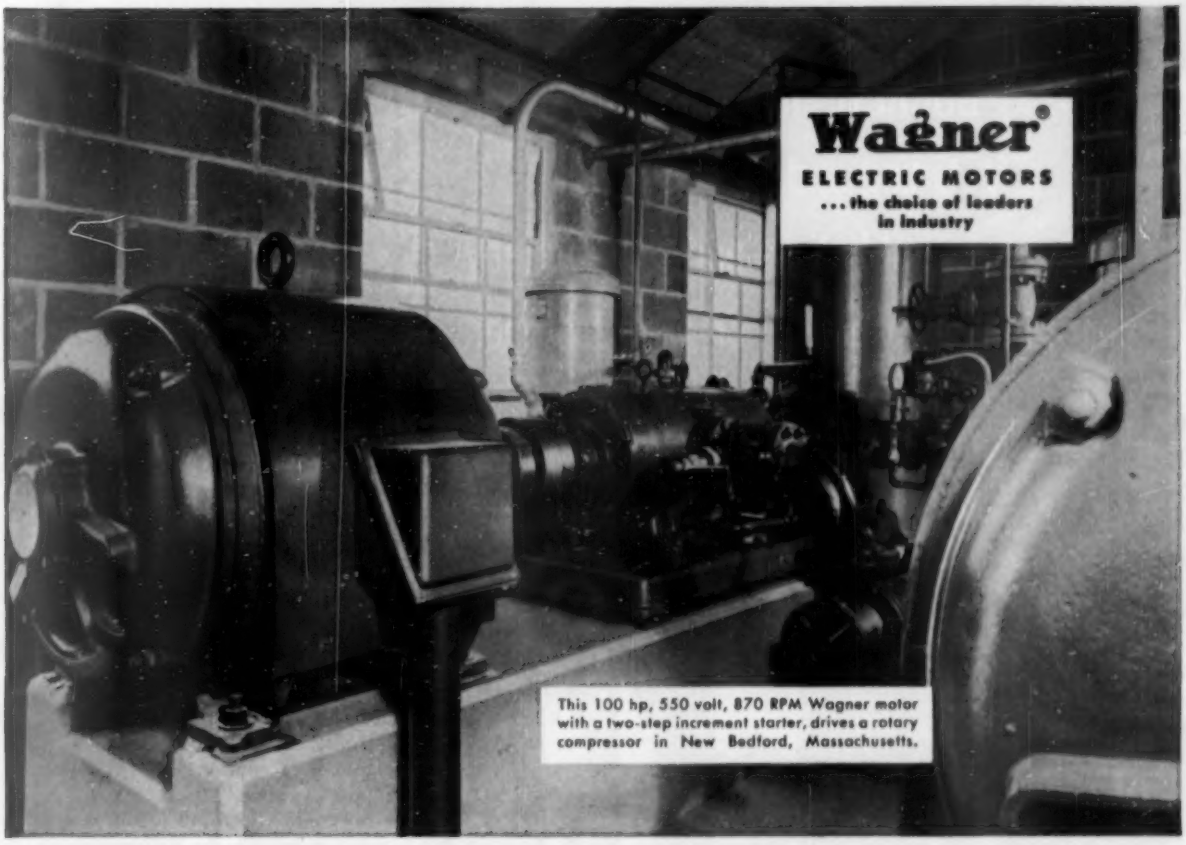
For more about these products, circle item numbers on Reader Service card next to back cover.

46—Rotary Actuator converts in-line motion of hydraulic or pneumatic cylinders into rotary movement. Especially applicable to remote control of valves. Operates with air, gas, or hydraulic pressures. 0-360 deg. of rotary movement. 5 models. *Carter Controls, Inc.*



47—Grab is for horizontal handling of heavy steel coils that vary in width. Pick-up and release are motor-operated, with remote control in crane cab or by floor man. Motor-driven turntable optional. Model G-1608-25 MA uses minimum aisle space. *Mansaver Industries.*

Turn the page



This 100 hp, 550 volt, 870 RPM Wagner motor with a two-step increment starter, drives a rotary compressor in New Bedford, Massachusetts.

Start large polyphase motors with minimum line voltage disturbance

USE THE Wagner INCREMENT MOTOR AND STARTER COMBINATION

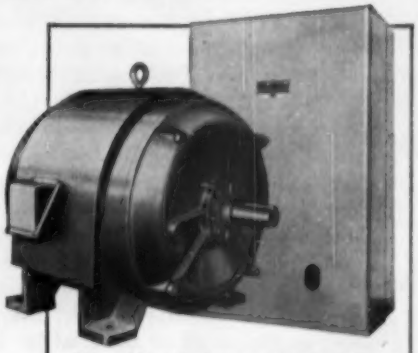
Here's a modern, economical, highly efficient way to start large polyphase motors – the Wagner Increment Motor and Starter "Package."

By reducing current drawn from the line on each point of the starter, the combination limits the inrush of motor current to values that are acceptable for the distribution systems of most power companies.

Voltage disturbances on the line are reduced because current taken from the line is not broken during the starting period—as it is when auto-transformers or compensator type starters are used.

Wagner two-step increment motor and starter combinations are suitable for most applications. For installations where unusually low inrush of starting current is desired, Wagner can furnish three-step and four-step increment starters.

Your nearby Wagner engineer will help you select the increment motor and starter combination that meets *your* requirement. Call the nearest of our 32 branch offices, or write us.



Type RP polyphase motor in ratings to 400 hp with increment type starter

Wagner Electric Corporation EST. WE 1891

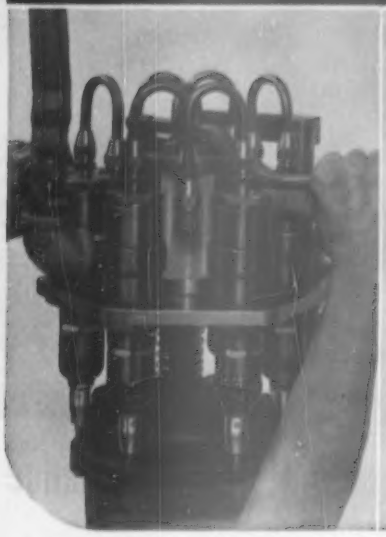
Wagner Electric Corporation
6412 Plymouth Ave., St. Louis 14, Mo., U.S.A.

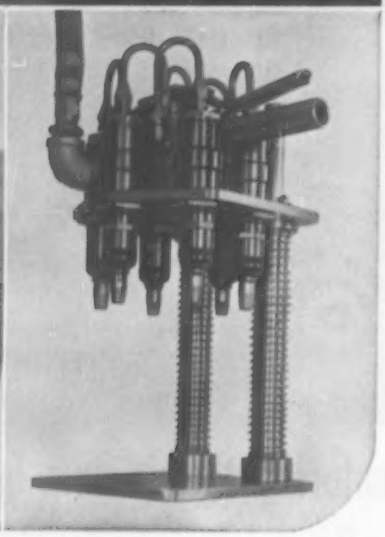
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M55-16

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS–AIR AND HYDRAULIC

BUCKEYE multiple-unit
fastening and drilling tools
reduce assembly time and costs on any
operation involving two or more fasteners.





Now—an entire assembly operation, where two or more fasteners are used, can be completed in the same time required to drive a single fastener. The savings you can make will increase directly with the number of tools in your Buckeye multiple-unit tool. You decide how many screws or nuts you wish to drive—simultaneously . . . or how many holes you want to drill—simultaneously . . . you're limited only by the air supply available in your plant.

Tools can be positioned to match any horizontal drilling or fastening pattern, and to compensate for any differences in vertical position of screws, nuts or workpiece. A Buckeye multiple-unit tool will drive screws and nuts of different sizes and types . . . will drill holes of different sizes and depths—and do either job simultaneously. Tool capacities, in multiple units, are identical to individual tool capacities.

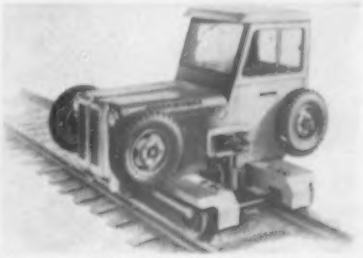
Buckeye multiple-unit fastening and drilling tools are engineered to your specific requirements. They may be arranged on self-supporting arms, as illustrated, or designed for suspension above the work. Just send a letter or sketch, outlining your assembly operation, or ask to have a Buckeye Tools Sales Engineer visit you. Either way, it costs you nothing to learn how you can step up assembly output and cut assembly costs—simultaneously.

Buckeye Tools
CORPORATION
DIVISION 13 • DAYTON 1, OHIO

producers of
the world's first
successful
rotary air tools

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.



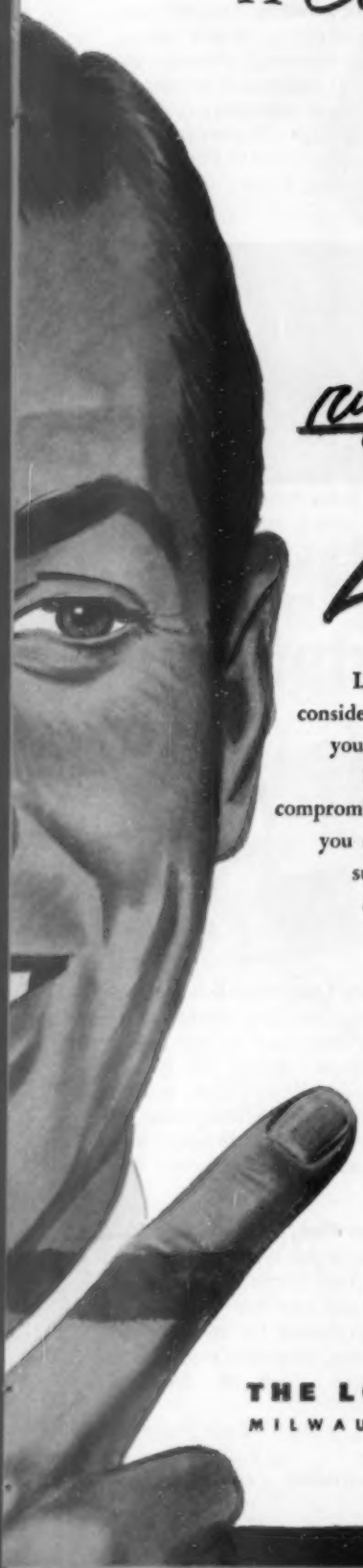
48—"Trackmobile" for railroad sidings hauls, switches, and spots railroad cars. Operates on both road and track; converts from road to rail wheels in 90 sec. Can drive over unimproved tracks. Heavy-duty Model 3-TM develops 12,800 lb. draw-bar pull. *Whiting Corp.*

49—Level Controller utilizes electronic capacitance sensing elements to detect minute level changes in tanks, drums, process baths, pipelines, etc. Electronic signals are then converted by the "Pneutronic" to proportional pneumatic output. *Robertshaw-Fulton Controls Co.*

50—Hydrogen Probe for processing indicates on pressure gage when hydrogen blisters are corroding walls of metal tanks in which chemical reaction is in process under pressure. Probe may be removed, inspected, replaced without taking tank out of production. *Texsteam Corp.*

51—Steam Generator features balanced feed, although it's an automatic, forced-circulation type. Cold water entering system from supply is never admitted directly to coils. It's preheated, thus freed of much of its mineral content. Four 15-hp. models. *Clayton Mfg. Co.*

Turn the page



A Complete adjustable speed line

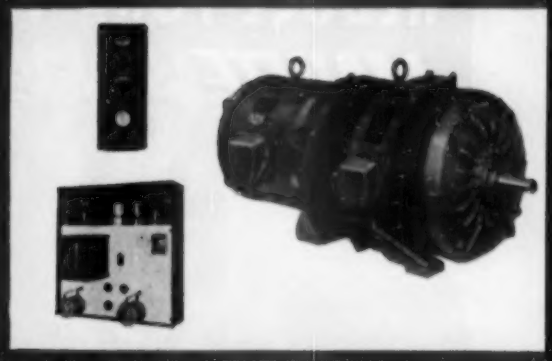
Get the right answer from Louis Allis

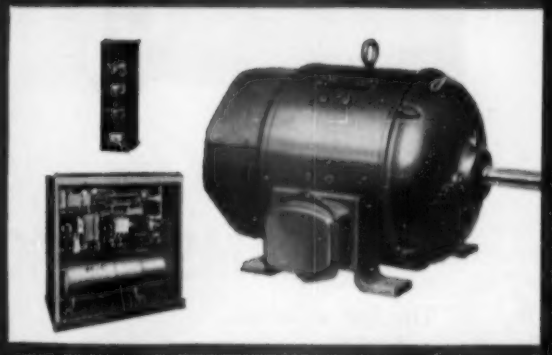
It pays to think first of the Louis Allis Co. whenever you're considering adjustable speed drives for your product or plant. Louis Allis builds all basic types. There's no compromising — from this complete line you can select the unit that's exactly suited to your job conditions and engineered for your application.

For the simplest — and best — solution to any adjustable speed drive problem, call your nearby Louis Allis Sales Engineer, or write to us.

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

ASD-101





REDUCE FORK TRUCK *MAINTENANCE COSTS!*

Up to 30% or more with

an LP Gas-operated LAMSON MOBILIFT ®

The low maintenance costs of LPG fuel . . . proven in other industries . . . can now be enjoyed by fork lift truck users.

The economical operation, long life and versatility of Mobilift is further increased by this alternate fuel system.

THESE MOBILIFT FEATURES ASSURE YOU OF TOP ECONOMY AND EFFICIENCY:

A high free lift at standard costs makes stacking easier and faster. All Mobilift trucks are easily accessible to driver position. No cramped quarters. "Every-side" visibility assures smoother, safer operation. Lev-R-Matic direction controls provide instant fingertip operation . . . eliminate gear shifting. Mobil-Matic transmission assembly delivers power smoothly . . . adds years to the life of engine, transmission and drive axle. All engine parts are within easy reach.

Mobilift trucks . . . "stand-up" and "sit-down" . . . range up to 4000 lbs. in capacity. Discover how LP Gas-operated Lamson Mobilift trucks can cut your handling costs and time.

MAIL THIS COUPON TODAY

LAMSON

MOBILIFT CORP.
Home Office
Portland, Ore.
Offices in principal cities

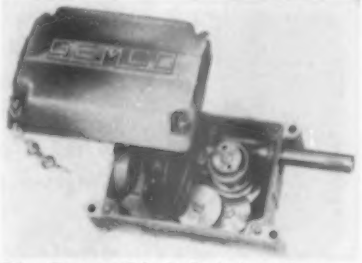
Lamson Mobilift Corporation
5212 Lamson Street, Syracuse 1, N. Y.
Please send me complete information on _____ Mobilift "sit-down" trucks _____ on Mobilift "stand-up" trucks, on _____ all Mobilift trucks.
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

52—Current Limiting Reactors limit short-circuit current to safe values, reduce effect of voltage disturbance. Cable-support columns of polyester-glass-resin cleats and epoxy-resin tie rods provide high compressive and tensile strength. 5-6000 kva. *Westinghouse Electric Corp.*

53—Dial Index Feed is for maker's and other punch and drill presses. Hand loaded or hopper fed; piece automatically positioned for machining. Actuated by stroke or travel of machine. 6000 strokes per hr. Easily installed. Models to 24 stations. *Benchmaster Mfg. Co.*



54—Rotary Limit Switch is for machine tools, handling devices, rotary operators where motion is by shaft rotation. Ratios of 250:1, 500:1, or 1000:1. Two microswitches, operated by independently adjustable cams, provide upper and lower limits. *Gemco Electric Co.*

55—Plastic Pipe, polyvinyl chloride, is available in two types: normal impact for high chemical resistance, high strength, excellent creep properties; high impact for good chemical resistance, toughness even at low temperatures. ½-6 in. *National Tube Div.*

Turn the page

Accent
on high engin ring skill

and product control throughout the years

Centric Centrifugal Clutch-Couplings and Clutches for the improvement of any power drive have been designed, engineered and manufactured for years under the same management—and with the same expert production facilities. Thus high standards and complete satisfaction are assured.

Skilled craftsmen of design and engineering in the field of power transmission, plus accurate production control have made available a complete line of standard Centric Centrifugal Clutch-Couplings and Clutches—a line that is second to none in motor, indirect, engine and dual drive performance. Added to the established line is the new Centric Trig-O-Matic Overload Release Clutch.

For smooth cushion starts, complete acceleration control, overload protection install CENTRICS.

CENTRIC *Clutch Company*

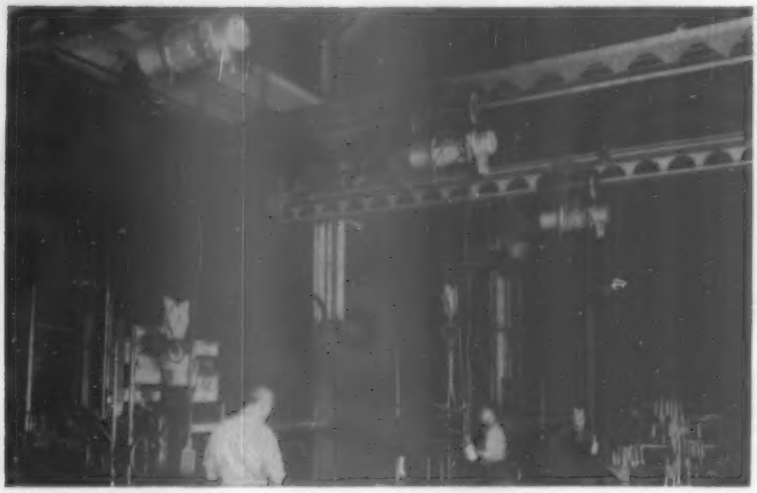
P. O. BOX 175 • U. S. ROUTE 9 AT MAIN STREET • WOODBRIDGE, NEW JERSEY

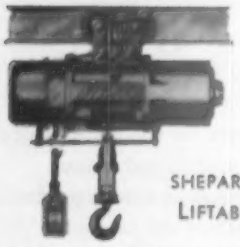
SHEPARD NILES

LIFTABOUT-JR.

PACE SETTER

on your production line





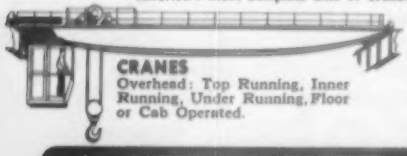
SHEPARD NILES
LIFTABOUT-JR.

MEN AND MACHINES both produce faster when a Liftabout-Jr. carries the load! Manual lifting and lugging are banished . . . the worker puts the load right where it's wanted with ease. Ideal for "spot" handling or for speeding raw materials and products along your production line.

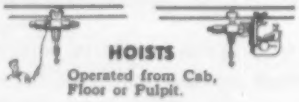
Shepard Niles Liftabout-Jr. is built to withstand years of use and abuse . . . it's the toughest medium-service hoist money can buy. Available with either rope or push button operation . . .parallel or cross-mounted with bolt, hook or trolley suspension in 250, 500, 1000 or 2000 lb. capacities.

Send for Hoist Bulletin today . . . and request a Shepard Niles representative to call. He'll give you the facts on the complete Liftabout-Jr. line . . . help you select the hoist with the right capacity and controls for your lifting job.

America's Most Complete Line of Cranes and Hoists since 1903



CRANES
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated.



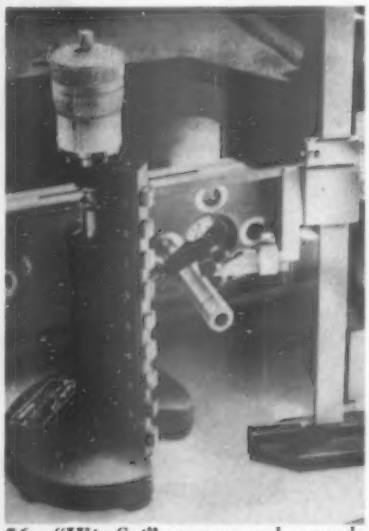
HOISTS
Operated from Cab, Floor or Pulpit.

SHEPARD NILES
CRANE AND HOIST CORPORATION

1157 Schuyler Ave., Montour Falls, N.Y.

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.



56—"Hite-Set" eases and speeds precision height settings and measurements from surface plates and machine tables. Few turns of thimble bring settings to nearest 0.0001. Blocks are exactly 0.5000 in., so settings can be made from bottom surface. *Brown & Sharpe Mfg. Co.*

57—Mammoth Die Handler can lift up to 110,000 lb. Unit is equipped with two winches for handling 55-ton dies into and out of metal working presses. Picture above shows it lifting a "Skylift Giant" fork truck without difficulty. *Automatic Transportation Co.*

Turn the page

Bremen Bearings, Inc., uses SUPERLA *Soluble Oil to give bearings the clean, cool treatment*

PRECISION NEEDLE BEARINGS are the exclusive product of Bremen Bearings, Inc., Bremen, Indiana. SUPERLA Soluble Oil is used exclusively in all eight of the Company's Cincinnati Centerless Grinders. Plant management experimented with various soluble oils before settling on SUPERLA. They found none could compare with SUPERLA Soluble Oil with respect to wheel loading, stability and tool machine cleanliness.

Plus these benefits, Bremen found SUPERLA mixed readily with water regardless of degree of hardness. The Company found, too, that they got longer tool life and maximum rust protection of work and machines.

You will have the same experience with SUPERLA Soluble Oil. Find out. Inquire of your Standard Oil lubrication specialist. In the Midwest call your nearby Standard Oil office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY (Indiana)

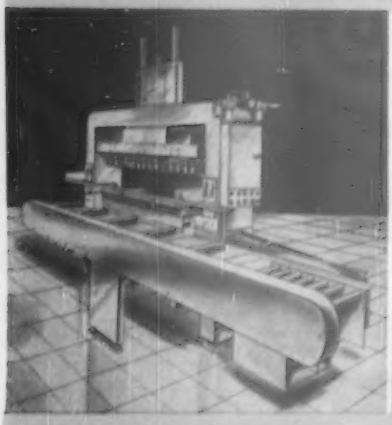
STANDARD

Franklin D. Clark (right), Sales Manager, Bremen Bearings, Inc., and Standard Oil lubrication specialist E. A. Hunt, inspect needle bearing. Gene Hunt is well qualified to assist industrial plants on lubrication problems. In addition to his three years' experience in industrial lubrication sales work, Gene has an M. E. degree from Purdue and has completed the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them*.

Bearings being ejected from Cincinnati Centerless Grinder at Bremen Bearings, Inc. The Company manufactures needle bearings to customers' specifications in sizes from 1/16 to 1/2 inch with tolerances of .0001" and finishes to 3 micro-inches. SUPERLA Soluble Oil is used on all of the Company's grinders.

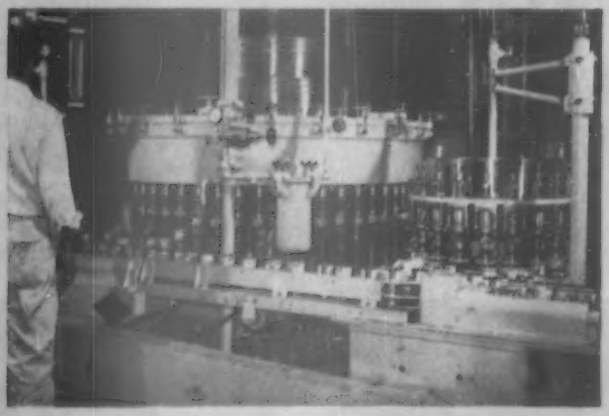
Norgren PRESSURE REGULATORS

for accurate control of automatic machines



NEW-MATIC UNCASER This machine automatically removes empty bottles from cases at a maximum rate of 432 bottles per minute. Six double-acting air cylinders do the work. Accurate air pressure control is provided by three Norgren Pressure Regulators.

Dependable air line filtration and lubrication are provided by Norgren transparent bowl filters and lubricators. For complete details, write for Norgren Blueprint No. 123.



CANNING MACHINE This beverage canning machine at White Rock Canning Company, Denver, Colorado, uses a Norgren ½" Pilot-Controlled Pressure Regulator to control air pressure in the reservoir. Extreme accuracy of reservoir pressure is necessary to provide consistency in filling cans to a predetermined level.

You, too, can have dependable pressure regulation with Norgren quality regulators.

A Complete Line of Pressure Regulators — NEARLY 400 STANDARD MODELS

...plus many others designed to meet specific job requirements

Write for complete data on Norgren Regulators or phone the Norgren representative listed in telephone directory classified section under Norgren Pneumatic Products.

C. A. Norgren CO.
3421 So. Elati, Englewood, Colo.

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products, circle item numbers on Reader Service card next to back cover.

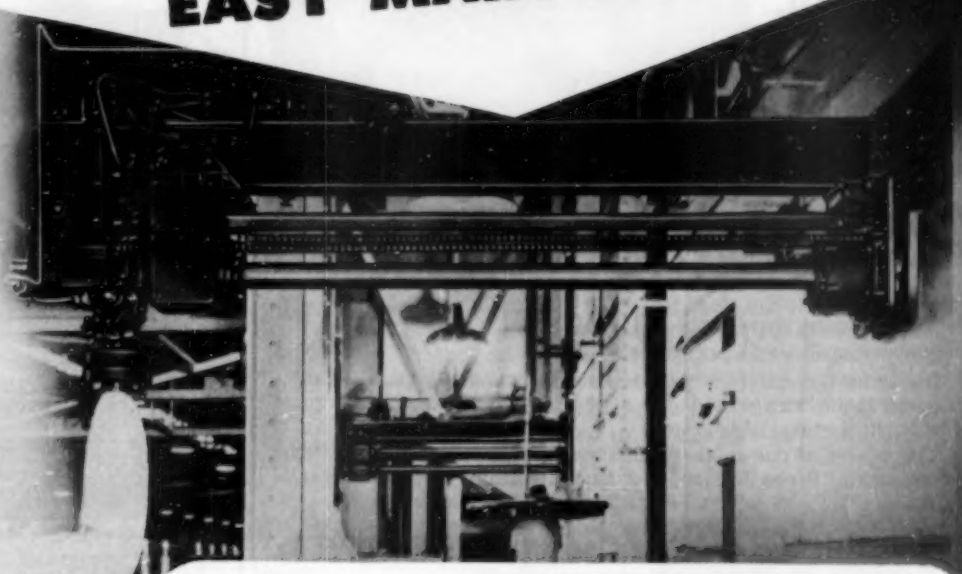
58—Disposable Paper Wipers consist of two embossed sheets welded together for extra durability. Provide thorough cleaning action, maximum dirt retention. Treated for wet strength. Compact "pop-up" box of 125 for convenient work-place location. *Scott Paper Co.*

59—Tractor-Shovel is ideal for stockpile work. Short turning radius and rear-wheel power steering speed maneuvering. Model HAH two-wheel drive "Payloader" has struck capacity of ¾ cu. yd.; heaped capacity of 1 cu. yd. Lifts to 7 ft., 9 in. *Frank G. Hough Co.*

60—Big Flattener squeezes air out of bags so they take less room in stacking. Tensions are adjustable. Bags may be fed at right angles or straight through. Upper and lower decks individually powered; speed synchronized. Various widths and powers. *Sage Equipment Co.*

Turn the page

LOW FRICTION
SELF-CLEANING
EASY MAINTENANCE



VULCAN BLOWERS RELY ON ATLAS
for longer trouble-free service

As the jets move in and out on Vulcan Long Retractable Soot Blowers, manufactured by Copes-Vulcan Division, Continental Foundry & Machine Co., they depend on Atlas Roller Chain to supply the positive drive that needs little lubrication, is self-cleaning and is easily maintained.

Wherever a positive drive is required—low or high speed—there's an Atlas Roller Chain and "precision-matched sprocket" for low maintenance performance. Atlas Chain is toughened for extra wear by an exclusive heat treating process which builds greater strength and wear resistance into every pin, roller and link. It is pre-tested by a series of torture-tests that assure outstanding service on grueling drives or rugged shock loads.

For full rated speeds on your machine, longer wear, lower maintenance get the roller chain with the service "extras". . . pre-tested more than 30 times for longer trouble-free service. Get Atlas Roller Chain and Sprockets . . . write for the Atlas Catalog and Handbook.

ATLAS CHAIN & MANUFACTURING COMPANY
DOYLESTOWN, PENNA.

ATLAS
ROLLER CHAIN AND SPROCKETS

'ever Investigate? . . .

CRANE MODERN-IZATION INSTEAD OF REPLACE-MENT

A typical modern Euclid trolley

A good crane is capable of many years of service. When it does show serious signs of wear it can often be rebuilt and modernized in the process at a considerable saving under the price of a new crane.

Crane bridges rarely require replacement and the installation of a new trolley can provide the very latest developments and most efficient features of operation.

The advice of our engineers in such matters is available without obligation. Write for the new Euclid Catalog and call upon us if we can be of service.

Euclid Cranes

The EUCLID CRANE & HOIST Co.
1364 CHARDON ROAD
CLEVELAND 17, OHIO

GRATING

Open steel flooring; welded or riveted pattern; fabricated in carbon or stainless steel, aluminum, monel and alloys.

when you specify KLEMP You Eliminate Maintenance Costs and Assure Worker Safety!

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A steel floor armor designed to prolong the life of floors 5 times! Installed in concrete or mastic on new or existing concrete or wood floors

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FACTORY / EQUIPMENT NEWS

Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

61—Bonding Material has high sheet strength of 2500 psi. Bonded to glass (above) it holds 65-lb block. "Clinch-T" bonds new concrete to old, plaster to cement before cement is cured. Humidity-proof, non-toxic, vermin-proof, acid-resistant. *Dasco Chemical Co.*

62—Foot Switch makes positive contact no matter where pushed—on top, or anywhere on circumference. Can be activated by hand, elbow, or knee. Ideal for precise, involved, dangerous manufacturing processes where worker needs to have hands free. *Birtcher Corp.*

63—Loadbreak Cutout is for distribution circuits that can interrupt load and fault current. For fault current, performs conventionally. For load current, fuse link is broken mechanically by lever-operated toggle. Breaks lines 5-100 amp. *Westinghouse Electric Corp.*

Turn the page

IT'S LYON 5 TO 1

• Key men in companies throughout the country have given Lyon five times more first choice votes than any other steel equipment manufacturer! And more than the next thirteen combined!

Those are the findings of a nationally known research organization that asked executives in 5,000 companies this question:

"If your company were in the market for steel equipment such as steel shelving, lockers, work benches, shop boxes, etc., what manufacturers would you consider?"

Your nearest Lyon Dealer offers the world's most diversified and most preferred line of quality steel equipment. (A few are shown below.) Equally important, he can show you how to get the most out of steel equipment in time, space and money.

LYON METAL PRODUCTS, INC.
General Offices: 1212 Monroe Ave., Aurora, Ill.
Factories in Aurora, Ill. and York, Pa.
Dealers and Branches in All Principal Cities

Lyon also has complete facilities for manufacturing special items to your specifications.

LYON®

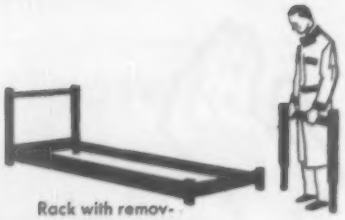
STEEL EQUIPMENT

for BUSINESS • INDUSTRY • INSTITUTIONS
also STEEL KITCHENS for THE HOME

A PARTIAL LIST OF LYON STANDARD PRODUCTS

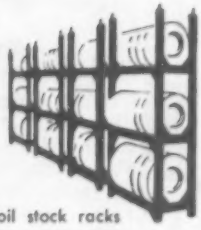
• Shelving	• Kitchen Cabinets	• Tool Toters	• New Freedom Kitchens	• Flat Drawer Files	• Folding Chairs	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• Display Equipment	• Revolving Bins	• Coat Racks	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Filing Cabinets	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

Racks



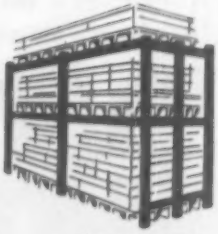
Rack with removable end frame

Rack with removable casters



Coil stock racks

Store, stack and transport stock and parts with MHS Custom-Tailored Racks . . .



Collapsible pallet storage racks

Racks are easily tiered

MHS Racks, engineered to your particular use, are efficient production tools. They simplify handling of parts and components for both production and shipping, increase storage capacity of present floor areas, minimize damage, promote safety, reduce confusion and clutter.

MHS racks are custom-tailored to handle pallets or any material from sheet glass to heavy, irregular shaped components. They stack securely, may be tiered as high as space permits. They may be portable, fixed, mounted on casters, or collapsible.

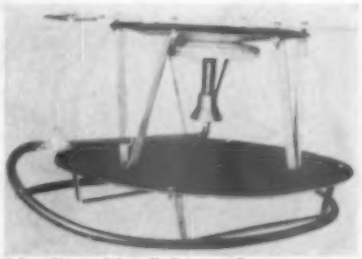
Here is a way to save space, labor, time and damage. Investigate MHS Racks. Write today for information.

Mechanical Handling Systems Inc.
AND SUBSIDIARIES
4608 Nancy Ave., Detroit 12, Michigan
Offices in Principal Cities
FACTORIES: Detroit, Mich. • Fairfield, Iowa • Albany, N. Y. • Windsor, Ontario

FACTORY / EQUIPMENT NEWS

Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.



64—Portable Salamander operates on LP gas. Unusual construction assures wide distribution of heat. Constructed of 16-gage steel; stands 16-in. high; diameter is 24 in. Comes equipped with 10-ft. hose. "Redi-Heater" has capacity of 25,000 Btu. *Grimm Brooder Mfg. Co.*

65—Valve Actuator increases advantages and utility of electronic controls. Applies electrical output direct to final control element. Self-contained; includes valve, hydraulic power, proportional positioner for use with existing controllers. *Askania Regulator Co.*

66—Oil-Resistant Conveyor Belt resists penetration of vegetable and animal oils and fats. Nitrile synthetic rubber cover won't swell even after long service. Light tan cover is easy to clean. Smooth top for horizontal haulage, rough for inclines. *Hewitt-Robins, Inc.*

Turn the page

A-B explosion-proof solenoid starter on liquid petroleum gas compressor.

A-B Bulletin 609 manual starter on Barnes-dril magnetic and fabric filter.

A-B solenoid starters and 3-button station on Economy shaving machine.

A-B Bulletin 709 solenoid starter on Oliver 36 inch, 5 hp band saw.

Bulletin 609 manual starter showing overload breakers. Bulletin 709 automatic solenoid starter. Bulletin 712 combination starter with fuses and disconnect.

3 MOST POPULAR MOTOR STARTERS

These three across-the-line starters are so popular because each is a QUALITY product in design and construction, which provides continuously accurate and reliable thermal overload protection. Costly motor burn-outs are prevented and machine shutdowns are avoided.

Bulletin 609 Manual Starters

Because these starters are push-button operated, they can be mounted in close groups if necessary. Switching mechanism is both "quick make" and "quick break." Sustained overload trips the starter and stops the motor. The overload breakers are reset by pushing the STOP-RESET button. Available up to 5 hp, 220 v; 7½ hp, 440-550 v.

Bulletin 709 Solenoid Starters

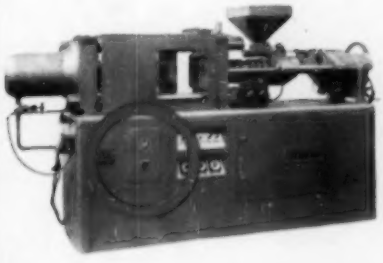
The simple design—only one moving part—of these remote control automatic starters assures long life and trouble free operation. Provide reliable motor overload protection. They also give no-voltage release protection that prevents the accidental restarting of stalled motors. The operator must press the START button to restart the motor. Available in ratings up to 300 hp, 220 v; 600 hp, 440-550 v.

Bulletin 712-713 Combination Starters

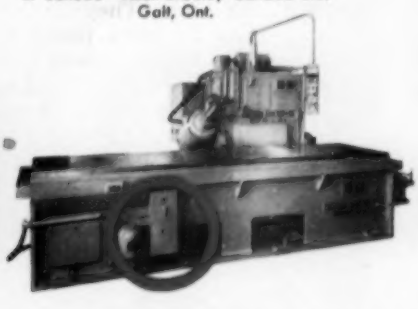
These compact starters save space and installation cost by combining magnetic starter and manual visible blade disconnect or circuit breaker in a single cabinet. This assures a neat, safe installation, because starter cabinet cannot be opened unless disconnect lever is in the "OFF" position. Available with manual disconnect up to 100 hp, 220 v; 200 hp, 440-550 v. With circuit breaker up to 200 hp, 220 v; 400 hp, 440-550 v.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

In Canada—Allen-Bradley Canada Ltd.
Galt, Ont.



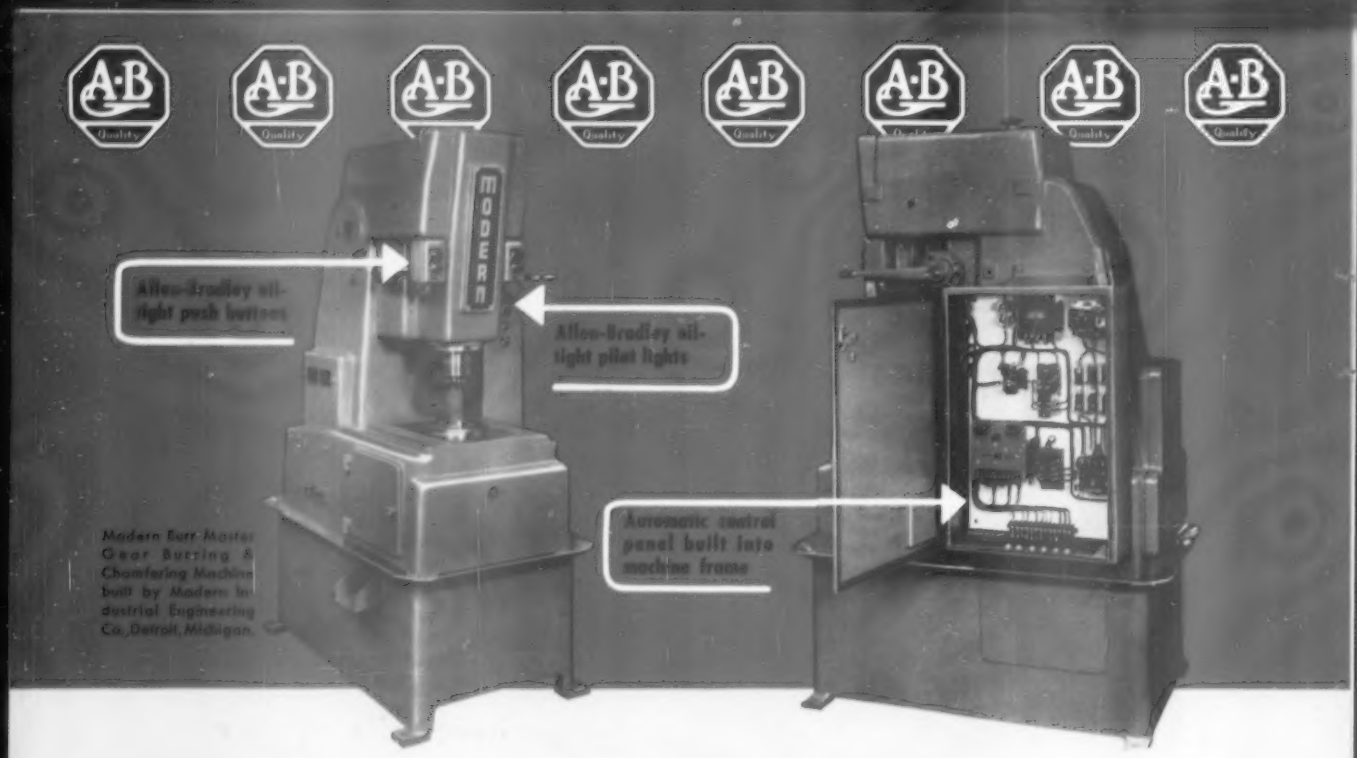
A-B flush-type Bulletin 709 starter on Stokes injection molder.



A-B Bulletin 712 combination starter on Ekstrom-Carlson scarf mill.

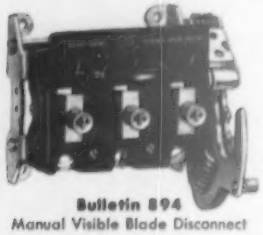
10-55-MR

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY


Allen-Bradley oil-tight push buttons
Allen-Bradley oil-tight pilot lights
Automatic control panel built into machine frame
Modern Burr-Master Gear Burring & Chamfering Machine built by Modern Industrial Engineering Co., Detroit, Michigan.

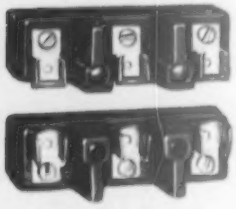
How to Build Trouble Free Automatic Control Panels

ALLEN-BRADLEY PANEL COMPONENTS



Bulletin 894
Manual Visible Blade Disconnect

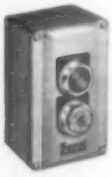
Bulletin 700 Universal Relays up to 8 poles a-c or d-c



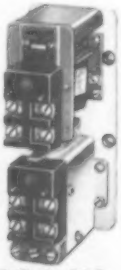
Bulletin 891
Adjustable Fuse Clips

Bulletin 800T Oil-tight Pilot Light with glass lens

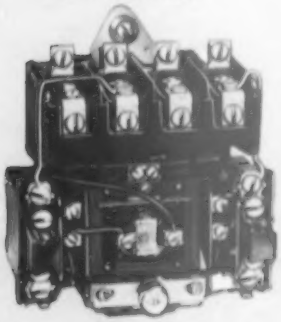
Bulletin 800T Oil-tight Push Button



Bulletin 800T Oil-tight Push Buttons



Bulletin 849
Pneumatic Timer



Bulletin 709
Solenoid Starter

Bulletin 350
Drum Switch

Special control panels—to be reliable and trouble-free—must be built of reliable starters, relays, timers, indicating pilot lights, etc.

When you standardize on the Allen-Bradley line of control components, you get the benefits of years of practical experience with all types of control problems. But, best of all, let Allen-Bradley design and build your trouble free panels for you. Call your nearest Allen-Bradley office for friendly counsel.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd.
Galt, Ont.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

10-55-MB

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

67—Packaged Chiller is completely enclosed in insulated cabinet. Panels on four sides and top of cabinet are removable for easy cleaning and servicing. Suitable for air conditioning, chilling drinking water, cooling and processing, pre-cooling. 3-15 hp. *American Coils Co.*

68—Automatic Lubricator is for precision machines. Constant pressure rotary pump unit maintains oil film of constant thickness, eliminating oil dripping, rise and fall of bearings due to periodic hand oiling, cyclic lubrication. *Bijur Lubricating Corp.*

69—Incinerator uses unusual principle for smokeless, odorless operation. Controlled air is drawn in by venturi action; attains accelerated combustion; produces high temperatures—burns combustible gases, eliminates odors. Fly ash settles in chamber. *Bowser, Inc.*

Turn the page

The Spray Booth Floor Grating That Cleans Itself . . .
engineered by PLANET

At a leading automobile plant, Planet Corporation has designed and installed a 3,400 foot multi-story dragline. It moves auto bodies through a series of lacquer spray booths, and then through drying ovens to the trim line for trim, upholstering, and glass.

Before this installation, the floor grating in the spray booths had to be removed frequently for cleaning because of lacquer accumulation.

Now, the grids are self-cleaning. They move at a rate of a few inches per minute, passing through a series of cleaning tanks under the floor.

The Planet solution to this problem has resulted in a substantial savings in cost and time.

An automatic system of this kind is just one of many ways Planet engineers can help you solve your particular materials handling problem. Their experience and know-how is available, without obligation. Write today.

PLANET
CORPORATION
1814 SUNSET AVENUE
LANSING, MICHIGAN

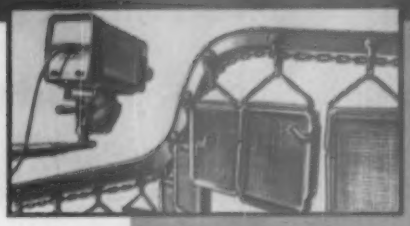
- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

"IT PAYS TO PLAN WITH PLANET"

LET DIAMOND UtiliVue

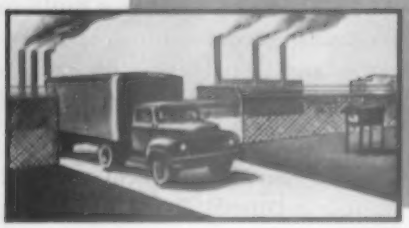
INDUSTRIAL TELEVISION SYSTEM

Do the "WATCHING and WAITING"



"UtiliVue"—Industrial Wired Television can solve the problem of coordinating conveyor loading to avoid pile-ups and lost time. Any number of points may be watched simultaneously.

Processes which are too dangerous for direct observation may be watched safely by "UtiliVue". This includes destructive tests of machines, tests of explosives, atomic operations, etc.



"UtiliVue" cameras are available in weatherproof housings which enable one guard to watch several entrances at the same time. This is particularly useful for remote, infrequently used entrances.

Many plants have "watching and waiting" jobs scattered around . . . jobs where a man doesn't do anything except watch an operation and report at intervals to a person elsewhere.

The Diamond "UtiliVue" (wired television) can do the watching and waiting, releasing manpower for more productive work. It will watch any process . . . no matter how remote, dangerous or inaccessible . . . and bring a clear image to the observer. It enables him to SEE simultaneously and to coordinate several scattered but related jobs . . . an advantage obtainable in no other way. There can be no mistakes in communications. Get all the facts. Get in touch with your Graybar Distributor or use the coupon below.

Distributed by GraybaR ELECTRIC COMPANY

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO
OFFICES IN 19 PRINCIPAL CITIES
Diamond Specialty Limited—Windsor, Ontario
Since 1903, Diamond has Manufactured Quality Equipment for Industry

7118

DIAMOND POWER SPECIALTY CORP.
ELECTRONICS DEPT., P.O. BOX 41500
LANCASTER, OHIO

Please send me without obligation a copy of new bulletin showing how Diamond Industrial (Wired) Television will help me reduce costs, improve quality, increase sales and aid safety.

Name_____

Title_____

Company_____

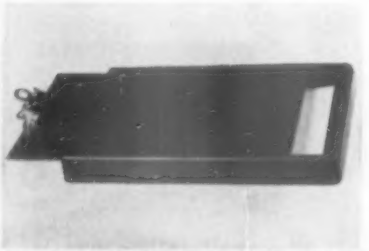
Address_____

FACTORY / EQUIPMENT NEWS

Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

70—Burglar Alarm (indoor) has electronically operated relay and photocell in one unit, exciter in other. For invisible light beam with range to 35 ft. May be regulated for continuous alarm or for alarm to sound only while light beam is broken. *Worner Electronic Devices.*



71—Portable "Desk" consists of box for papers, clipboard lid that slides in, snaps shut. Handy for anyone who has to carry and fill out papers while moving around, inside or out. Keeps papers safe, clean, dry. Notepaper, letter, legal, deep legal sizes. *Arthur Kramer.*

72—Hinged Superframe, available on "Short-Coupled Jacklift" electric pallet truck, enables truck to handle skid platforms as well as pallets. For single- or double-face pallets and skids of any underclearance. Capacities to 6000 lb. *Lewis-Shepard Products, Inc.*

Turn the page

IMPORTANT NEW BULLETIN

describes space-saving, weight-saving

Century

Performance-Rated
MOTORS
1 to 30 H. P.

MAIL THIS COUPON FOR YOUR *FREE* COPY...

To CENTURY ELECTRIC COMPANY CE-36
1806 Pine Street, St. Louis 3, Mo.

Please send New Bulletin 6-1P1 to:

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time is on the side of those who use it best... against corrosion!

You cannot afford to ignore the interruptive liabilities of Corrosion. You should take the time . . . *our time* . . . and ARco rubber compounds to prevent the catastrophe of corrosion to your chemical processing equipment.

Do not overlook the benefits of ARco Field Service where large, permanent equipment is concerned. ARco Field Service Units come to you staffed with experienced craftsmen and supervisors . . . completely equipped for this highly specialized work. The application of ARco-controlled Protective Coatings and Linings *is done right at job site.*

ARco expert workmanship . . . advanced procedures and controlled compounds assure against the ravages of corrosion on your equipment and production time.

Yes, put time . . . *our time* . . . on your side. Write, wire, or call for complete ARco Field Service details, Automotive Rubber Company, Inc., 12566 Beech Road, Detroit 39, Michigan.

detroit • kalamazoo • houston

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

73—Dehumidifiers, sprayed - coil, central-station type, feature heavy construction, complete accessibility to components, ease of maintenance. Coils and eliminators are removable. Available in various coil arrangements, 2300-45,900 cfm. *American Blower Corp.*

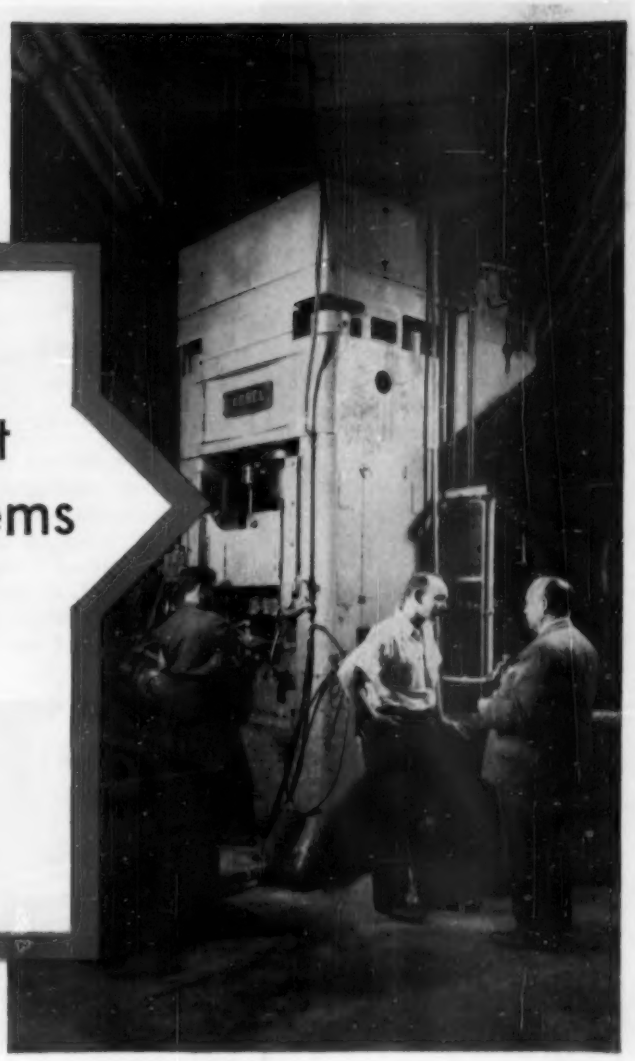
74—Utility Stool weighs less than 12 lb., has handles for carrying. Ideal for woman employees. One-piece units of fibrous glass stack when not in use. Won't tip, even on irregular surfaces. Non-shock, non-skid; withstand heavy loads, stress. *Burnham Products, Inc.*

75—Glove for welding and burning jobs in which hand does not directly grasp heated object has aluminum foil interlining to shield hand from radiant heat. Reflects as much as 95% of radiant heat back to source. Foil covers wrist to knuckle. *Olympic Glove Co.*

Turn the page

ease your
hydraulic equipment
maintenance problems
with

GULF HARMONY OIL



Use a hydraulic oil that has excellent resistance to oxidation, high film strength, outstanding rust preventive and anti-foam properties—qualities which hydraulic engineers consider to be the most important when selecting a hydraulic lubricant —and you will have fewer maintenance problems and less down time.

Gulf Harmony Oil has all of these qualities. It prevents the formation of sludge deposits and maintains its original viscosity over long periods of time. It also protects hydraulic equipment against excessive wear, even under severe conditions of pressure, speed, and temperature. And it protects against the damaging effects of harmful rust.

So if you have maintenance problems with your hydraulic equipment, call in a Gulf Sales Engineer. He will recommend the right grade of trouble-preventing Gulf Harmony Oil for your equipment. Contact him today at your nearest Gulf office.

GULF OIL CORPORATION
1822 Gulf Building

GULF

GULF REFINING COMPANY
Pittsburgh 30, Pa.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

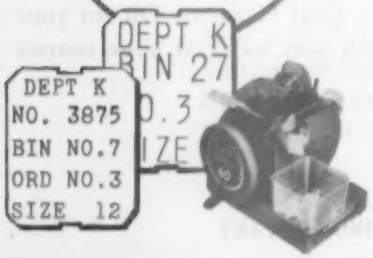
Y

. . . or you may need a dozen or more. In any case, there's a Monarch marking machine and a choice of tickets, tags and labels to do the job with economy and dispatch.

If you'll check this list and mail it to us with any questions, your inquiry will receive prompt attention. There's no charge or obligation. Our suggestions are based on years of experience with mechanical printing of tickets, tags and labels for many uses, including pressure sensitive labels requiring no moistening. Illustrated folders on Monarch Marking Machines, also sample tickets are yours for the asking.

MONARCH
CHECK LIST
for in-plant ticketing

- ☐ cost or other codes
- ☐ identification of part, product, or order
- ☐ salvage instructions
- ☐ piece-work record
- ☐ inspection data
- ☐ material control data
- ☐ quantity in lot
- ☐ pre-price marking
- ☐ size marking
- ☐ other—you name it!



The MONARCH
MARKING SYSTEM COMPANY
216 South Torrence St., Dayton 3, Ohio

FACTORY / EQUIPMENT NEWS
Begins on page 154

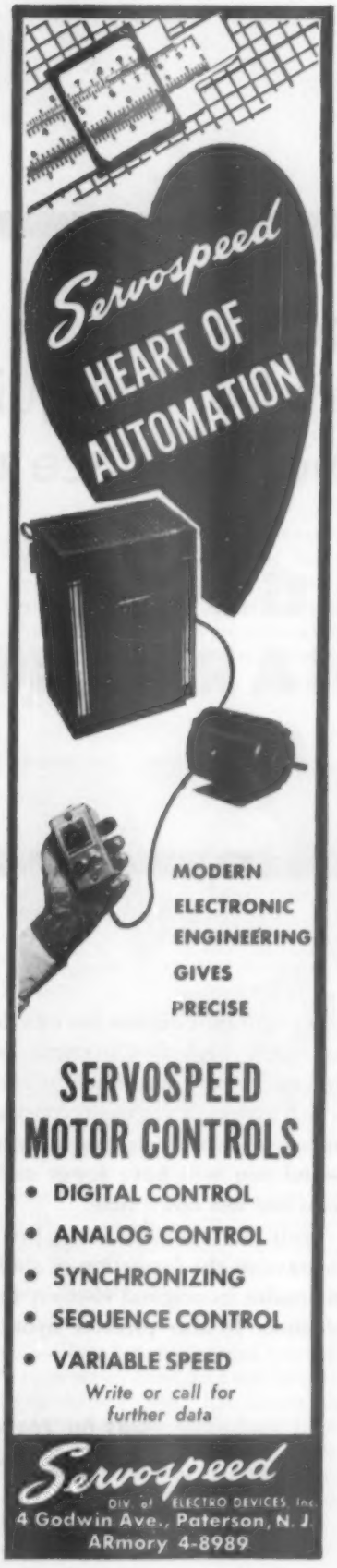
For more about these products circle item numbers on Reader Service card next to back cover.

76—Screw Drivers have blades of high-grade alloy steel given special heat treatment for greater wear-resistance, increased tip life. Tips don't get damaged, even when turning hardened self-tapping screws. Handles are shockproof, non-rolling. *Snap-on Tools Corp.*

77—Lifting Magnet, 4000-lb. capacity, battery-operated, is self-contained, unrestricted by electrical wires—ideal for use on lift trucks, shop hoists, conveyors, etc. Above, "Shop-Lifter" is lifting heavy milling machine table into position. *Ohio Electric Mfg. Co.*

78—Straddle Carrier features syncromesh transmission, full hydraulic control of load hooks, and radi-arc steering. Driver sits in center, instead of over rear axle, increasing operator visibility and comfort. Capacity of Series 71 is 10,000 lb. *Clark Equipment Co.*

Turn the page



SERVOSPEED
MOTOR CONTROLS

- **DIGITAL CONTROL**
- **ANALOG CONTROL**
- **SYNCHRONIZING**
- **SEQUENCE CONTROL**
- **VARIABLE SPEED**

Write or call for further data

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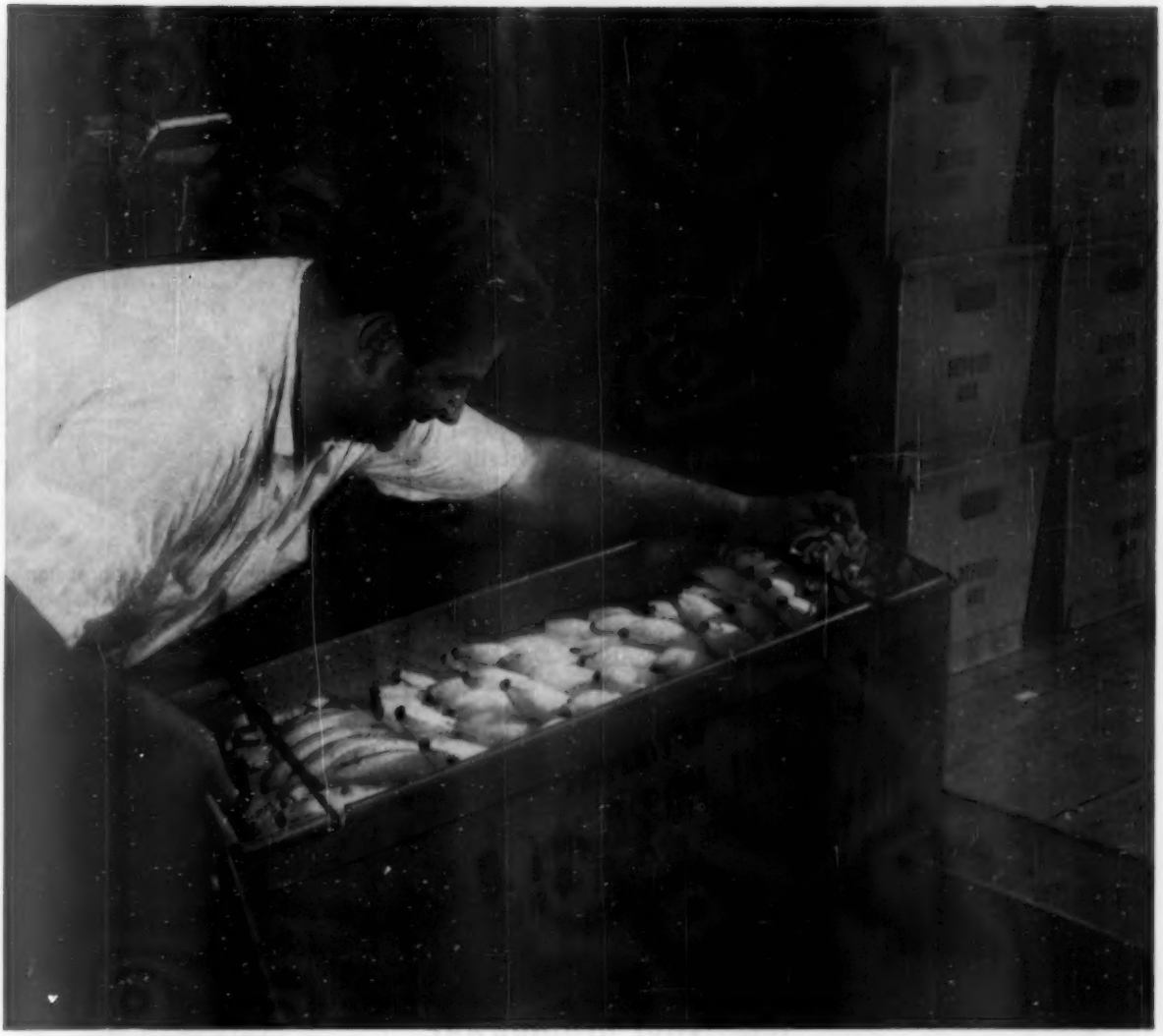
4 Godwin Ave., Paterson, N. J.
ARmory 4-8989



New banana box cuts cost and weight 66%

This new Gair banana container really rang the bell with client D. Loi & Son Banana Company of New York.

Made of special weatherproof solid fibreboard, the new box weighs a third of other wood or metal containers *(easier handling)*. It costs one-third as much as wood boxes, one-fifth as much as the metal variety *(big savings)*.

Gair designers gave it a double bottom *(protection against moisture)* and tapered the sides to permit nesting of empties *(saves space)*. Unique metal end frames allow stacking of loaded boxes without harming bananas *(less spoilage)*.

What's more, grocery and supermarket customers are happy about the new box – it doesn't scratch floors. And employees can handle more boxes faster because of their light weight. No danger of splinters, of course.

Ingenious design like this is making Gair's Container Division the strong right arm of many a manufacturer and materials handler. You can be next—just call the nearest Gair plant. SC. 5.9

YOU'RE LIVING NEXT DOOR TO THE EXPERT

GAIR CONTAINER PLANTS: Atlanta, Ga. • Cambridge, Mass. • Cleveland, Ohio • Holyoke, Mass. • Jackson, Miss. • Los Angeles, Cal. • Martinsville, Va. • New Orleans, La. • No. Tonawanda, N. Y. • Philadelphia, Pa. • Plymouth, Mich. • Portland, Conn. • Richmond, Va. • Syracuse, N. Y. • Teterboro, N. J.

SINCE 1864 GAIR

GAIR

SHIPPING CONTAINERS • FOLDING CARTONS

PAPERBOARD • KRAFT BAGS AND WRAPPINGS

ROBERT GAIR COMPANY, INC. • 155 EAST 44TH STREET • NEW YORK 17, N.Y.

YOUR EMPLOYEES DESERVE THE BEST PROTECTION

No one wants accidents, but they do occur. That is the time when a Lumber Mutual Workmen's Compensation policy becomes a blessing. The manner in which injured employees are treated and the prompt payment of compensation claims are vitally important to your business. Together they can build or destroy amicable employer-employee relations.

It will be worth your while to consult us.

New York Mutual
CASUALTY INSURANCE COMPANY

Formerly LUMBER MUTUAL CASUALTY INSURANCE COMPANY OF NEW YORK

HOME OFFICE
260 FOURTH AVENUE NEW YORK 10, N. Y.

BRANCH OFFICES IN PRINCIPAL CITIES

Put Your "Brains" *On Wheels*

Don't limit your brainpower to the mobility of a chair.

Frequent trips through your plant in an Agricola TS by the "brains" will:

1. Spot bottlenecks before they develop.
2. Catch the countless money wasters in your operation.
3. Make possible further expansion without additional supervision.
4. Keep production lines flowing smoothly.

Result: More profits for you!

Write for Information

AGRICOLA FURNACE CO., INC.
Gadsden, Alabama

Agricola Furnace Co., Inc.
Gadsden, Alabama

Gentlemen:
Prove to me on Agricola TS will save me money in my plant.

Name _____

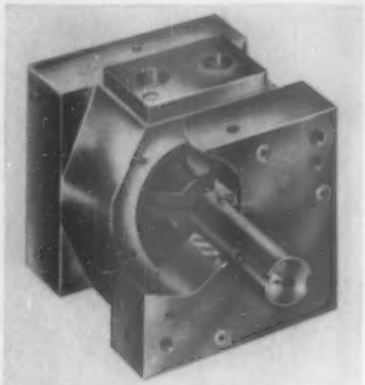
Company _____

Address _____

City _____ State _____

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.



79—Torque Motor is an instant-oscillating unit that obtains 280-deg. rotation or oscillation of a shaft without linkage or gearing. For turning, opening, closing, clamping, indexing, etc. Operates on air, oil, water, fire-resistant fluids. *Roto-Mation Motors, Inc.*

80—Fork Lift Trucks are giant-sized units available in 32,000-, 36,000-, and 40,000-lb. capacities. In spite of large size, they're easy to maneuver. "H" Series is ideal for handling steel and concrete pipe, logs, many other oversize loads. *Gerlinger Carrier Co.*

81—Circuit Breakers, molded case, have new, separate 480-volt a-c interrupting ratings. For F, J, K, L frame sizes they're 15,000; 20,000; 25,000; 35,000 amp. Formerly, interrupting ratings for 480 volts a-c were same as those for 600 volts. *General Electric Co.*

Turn the page

GAIN EVERY WAY WITH DE LAVAL GRINDING COOLANT CLARIFICATION...

With De Laval "Hermetic"* Coolant Clarifiers you . . .

Get longer grinding wheel life . . . with far fewer shut-downs for wheel dressing.

Reduce coolant cost to a minimum. Grinding coolant, either oil or aqueous, lasts indefinitely, only "make-up" being required.

Get finer finishes...due to complete removal of free abrasive grains from the coolant.

Speed up finishing operations.

It will pay you to investigate the De Laval System of Coolant Clarification. Write today for De Laval Bulletin F6-17.

*Registered Trade-mark

DE LAVAL

purifiers and clarifiers for factory oils

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

Ask Standard how to cut costs with conveyors

Order picking is expedited and simplified by this Standard system of roller and belt conveyors in large warehouse.

Roller and belt conveyors ease warehouse traffic jams

FAST flow of goods and simplified labor add up to more profitable warehouse operations.

Standard offers a wide variety of gravity and powered, permanent and portable conveyors — that can help you establish smooth, more profitable warehousing.

Spend a few moments with a Standard engineer. He'll show you how inexpensive Standard conveyors give you maximum flexibility at minimum cost. He'll show you, too, how Standard conveyors provide the many advantages of a custom-designed system at low cost. For the name of your nearby Standard engineer write STANDARD CONVEYOR COMPANY, General Offices: North St. Paul 9, Minn. Sales and Service in Principal Cities.

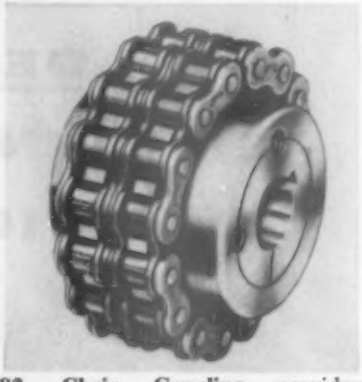
(LEFT) Belt-booster in a gravity roller conveyor "order picking" line. (RIGHT) Lift or lower floor-to-floor with an INCLINEBELT. Available in a wide range of heights and belt widths.

Write for Bulletin. 309-FM. Better still, contact the Standard engineer listed in your classified phone book.

Standard 50 years of conveyor experience

GRAVITY & POWER CONVEYORS

For more about these products circle item numbers on Reader Service card next to back cover.



82 — Chain Coupling provides strong, positive, yet compact, direct coupling of shafts. "Taper-Lock" units are flexible enough to accommodate slight angular and parallel shaft misalignment. Bushings are available in desired sizes—eliminating reboring. *Dodge Mfg. Corp.*

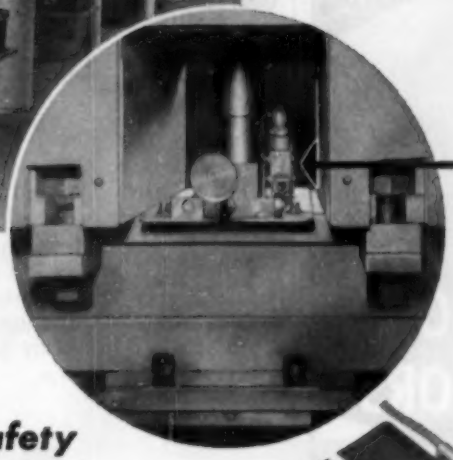
83—Scrubber removes microscopic solids, fumes, and odors from exhaust gases. Test showed 99% efficiency with dust loadings at 5 grains per cu. ft., 70% of material below 5-micron particle size. Type A units in 15 sizes, 500-40,000 cfm. *Johnson-March Corp.*

84—Build-It-Yourself Cranes save time, labor, shipping costs. One man can build in few hours, without special tools or skills. Assemblies include hand-geared underhung, top-running types; single and multiple trolley underhung push types. *Conco Engineering Works.*

Turn the page

MICRO SWITCH Precision Switches
A PRINCIPLE OF GOOD DESIGN

Battery of 200 ton transfer molding presses on which MICRO SWITCH switches were installed to provide additional safety, reduce operator effort and speed up production.



Simple actuating device eliminates reaching into the hot press mold to set plastic preforms in position. High temperature switch operates within confines of the mold.

Plant Engineer uses snap-action switch

to { *provide additional safety*
reduce operator effort
speed up production }

on 200 ton transfer molding presses

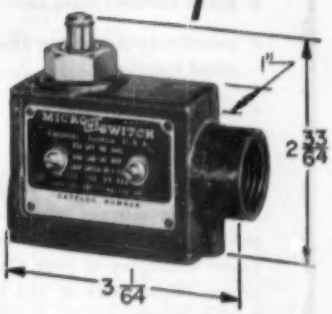
PROBLEM—Preheated plastic preforms were manually placed in the hot mold of the 200 ton transfer molding press. The operator then withdrew his hand to operate the control switch on the side of the press to start the molding sequence. Hand and arm were exposed to burns and injury from accidental ram operation.

SOLUTION—The plant engineer installed a plunger actuated switch within the mold and wired it into the ram control circuit. He made the special device (shown) with which to push the plastic preforms into proper position in the mold and, at the same time, operate switch to start the ram motion.

RESULT—The operator's hand and arm are never in the danger zone and, with one motion, the plastic preform is positioned in the press and the molding sequence started—automatically.

Plant engineers everywhere use these long-lived, precise switches as automatic checking controls and gages to insure quality of finished products. They use them as limits, safeties, interlocks and controls to increase production efficiency at minimum cost and with maximum safety.

There is a MICRO SWITCH *Distributor near you with a complete line of snap-action switches for every requirement. Look in the Yellow Pages under "Switches, Electric."*



A complete line of snap-action and mercury switches

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

TO GET BETTER WORK FLOW

USE FERGUSON CONVEYORS

You will end congestion at machines, in the aisles, at shipping and receiving platforms and get better work flow when you put FERGUSON CONVEYORS to work. That has been the experience of plant after plant in many different industries because these conveyors:

- keep material off the floor
- move material more directly
- coordinate in-plant and out-plant handling
- ease the work load
- save useable space

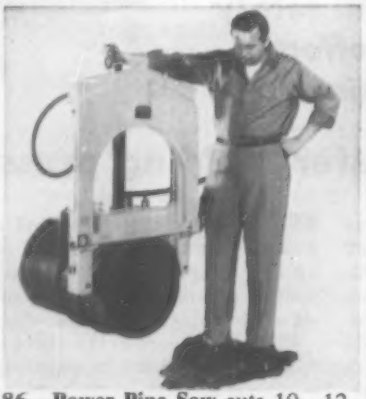
You'll soon get a big return on your investment when you put FERGUSON gravity and power conveyors in your plant layout. Write, wire or call for further details.

HARRY J. Ferguson COMPANY

143 West Avenue Jenkintown, Pa.
TUrner 4-4401

For more about these products circle item numbers on Reader Service card next to back cover.

85—Foot Switch is offered in three types of contact: impulse operates by pressing and releasing, with fraction of second contact, no contact on release; momentary starts by pressing, stops by releasing; maintained starts and stops by pressing. *Linemaster Switch Corp.*

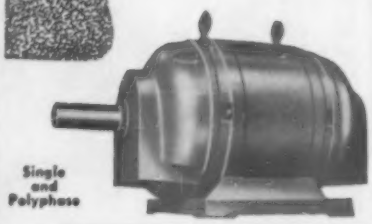


86—Power Pipe Saw cuts 10-, 12-, 14-, and 16-in. cast iron and steel pipe in minutes. Double chain vise of "Big Guillotine" clamps on in seconds. Saddle base assures square cut at right angle to pipe. Pipe acts as tool base. Takes only 32-in. space. *E. H. Wachs Co.*

87—Snowplow Attachment is available for ¾-ton powered wheelbarrow. 50-in. angling blade is easily installed, can readily be dropped off. While blade is being used, 10 cu.-ft. bucket can be filled with ballast or sand for spreading on icy areas. *Prime-Mover Co.*

Turn the page

CUSTOM-BUILT—
NOT CUSTOM PRICED



Fully enclosed Ball Bearings; semi-enclosed construction that protects against dripping and splashing hazards and assures cool, continuous operation. Available in polyphase—from ½ to 60 hp, single phase—from ½ to 5 hp, for wide adaptability of use and greater flexibility in your power planning.

Write for Complete Details Today

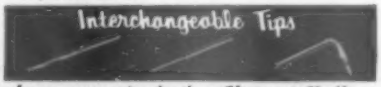
VALLEY
ELECTRIC CORPORATION
4221 FOREST PARK BLVD. · ST. LOUIS 8, MO.

...the Answer to better, faster soldering on printed circuits . . .

Type 200 Thermostatic Soldering Irons

Because Kwikheat Thermostatic soldering irons are especially designed for the close, tight soldering required for quality electronic equipment, production soars when old-style heavy irons are replaced by light weight (7½ oz.), perfectly balanced, small size Kwikheat Junior Type 200 irons.

Controlled by a sealed, built-in, high temperature thermostat that heats quickly, maintains preset heat (800° for production, 700° for stand-by) Kwikheat irons are economical and long lasting. Current used to maintain heat is only one-third heater capacity. Stainless steel core and tips resist corrosion. Three versatile, plunger type tips are easily changed in the field. Big, easy-to-grip plastic handle is air cooled, has a wide flange to protect hands.



Increase your production. Change to Kwikheat Thermostatic soldering irons today.

KWIKHEAT Manufacturing Co.
3732 San Fernando Rd., Glendale 4, Calif.

For heating and plumbing
at Ortlieb Brewing Company, Philadelphia, Pa. . . .

. . . radiant heating
at Washington-Douglass School, Jackson, Tenn. . . .

. . . snow melting
at a private residence, Syracuse, N. Y. . . .

. . . sprinkler system
at Collyer Wire Co., Pawtucket, R. I. . . .

. . . ice rink freezing
at Field House, Middlebury College, Vt. . . .

. . . air conditioning
at Kroger's Supermarket, Atlanta, Ga. . . .

it's SPANG® CW Steel Pipe

Manufactured under SPANG's strict *quality-control* conditions and doubly inspected before shipment, SPANG CW Steel Pipe is a *top-quality* product that is easy to cut, bend, thread and weld . . . gives you fast, trouble-free installations . . . keeps installation costs low . . . always assures years of dependable service in *every* type installation.

Next time you order pipe, cash in on these advantages. Specify SPANG CW Steel Pipe. See your local SPANG Distributor for *top-quality* service and delivery!

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

"Complete Control" solves another coffee-break problem!

A Rudd-Melikian coffee dispenser is the solution to the coffee-break problem in any plant or office. It serves Kwik-Kafé coffee—100% pure, fresh-frozen, delicious; also hot chocolate and a variety of other beverages. Regular servicing by your local Kwik-Kafé dealer. Check with him for full details—he's listed in your telephone directory—or write direct to us.

RUDD-MELIKIAN, INC.
Hatboro, Pa.

Kwik Kafe

Gentlemen:
Please send me a copy of booklet 13M explaining how to control the coffee-break with R-M dispensers.

Name.....
Firm.....
Street.....
City.....Zone.....State.....

FACTORY / EQUIPMENT NEWS
Begins on page 154

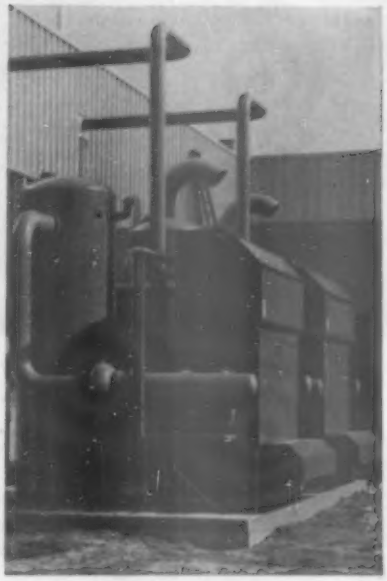
For more about these products circle item numbers on Reader Service card next to back cover.

88—Power Hacksaw Blade has chamfered teeth which improve metal-cutting six ways: makes straight cuts; teeth have longer life; there's less blade breakage; makes smoother cuts; blade cuts uniform, curled chips, no dust; last cut is made as quickly as first. *Atkins Saw Div.*

89—Machine Tool Control can control any number of linear and rotary axes, be programmed for simultaneous or sequential operations. "Inductosyn System" operates from keyboard; punched cards, tape, etc. For new machine tools, or conversion of old. *Farrand Optical Co.*

90—Ultrasonic Alarm System provides network of protection for entire premises against intrusion at night. Designed for use with burglar and police-alarm systems, but can be tuned down for localized protection. Even detects air turbulence caused by fire. *Diebold, Inc.*

Turn the page



This Niagara Aero After Cooler also cools compressor jacket and intercooler water.

COMPRESSED AIR
• Lower in Cost
• Drier and Cooler

THE NIAGARA *AERO* AFTER COOLER offers a completely self-contained method replacing both shell-and-tube cooler and cooling tower. It is independent of a large supply of cooling water and consistently reduces compressed air temperatures to below ambient.

Drier air gives you better operation and lower costs in using all air-operated automatic instruments, tools and machines, paint spraying, sand blasting and moisture-free air cleaning.

Direct saving in the cost of cooling water saves the price of the Niagara *Aero* After Cooler in less than two years.

Niagara *Aero* After Cooler assures all these benefits because it cools compressed air or gas below the temperature of surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air through a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter, proven in service on the largest plant utility systems.

Write for Bulletin No. 130

NIAGARA BLOWER COMPANY
Dept. F, 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Tuffy. SLING NEWS

Vol. 1 — Published Monthly in Leading American Trade Magazines by Union Wire Rope Corp. — No. 2

NEW Tuffy. FERRULE GIVES EYE SPLICE STRENGTH OF Tuffy. SLING FABRIC

1 **TREMENDOUS PRESSURE** of this machine in swaging Tuffy's smooth-edged metal ferrule around the tuck splice virtually flows the metal into the braided fabric interstices.

No Increase in Cost For Smoother, Safer Factory Ferrule Splice

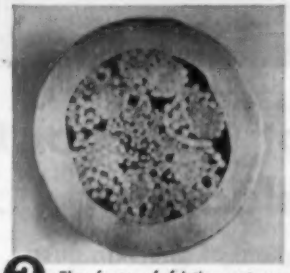
In the most important sling development since Tuffy machine braided wire was introduced, Tuffy now offers sling users greater safety, faster sling handling, and more sling-eye strength—at no increase in price.

It's all made possible by a new steel ferrule used on all Tuffy Slings. This ferrule, slipped over the splice of the eye and pressed on under great pressure, holds so tight that it gives the eye of the sling 100 per cent of the strength of the machine braided wire fabric. The tucked-in splice is completely covered—the swaged ends of the ferrule leave no abrupt edges to catch on loads or to injure workers' hands.

Teamed up with the Tuffy machine braided sling fabric, this new ferrule makes Tuffy the sling handler's favorite for every job.

Good Man To Know— Your Tuffy Distributor

Tell him your requirements. Then let him save you the time, trouble, and money of carrying an inventory. He will stock the Tuffy Slings you want and Tuffy Hoist Lines to team up with your Tuffy Slings.



2 The force of friction set up by compressing the ferrule metal on more of the wire fabric surface forms an eye that really stays spliced.

New Tuffy Sling Handbook FREE — Mail Coupon Now

This big 60-page book tells you all about new factory-fitted Tuffy Slings with our pressed-on ferrule and contains complete information about a full line of factory-fitted Tuffy Slings, nearly a dozen new standard fittings, and complete data and charts on all Tuffy Slings. It also has a brand-new engineer's notebook and a valuable rigger's manual. Send for your copy now. No obligation.

union Wire Rope corporation

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

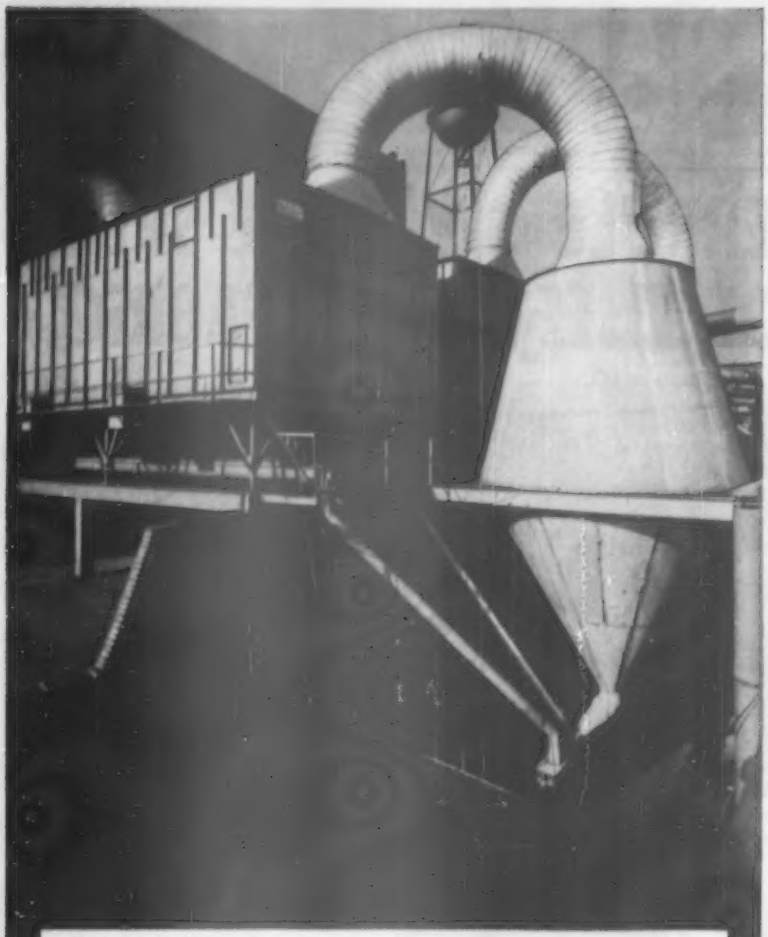
2234 Manchester Avenue, Kansas City 26, Missouri

MY NAME _____ TITLE _____

COMPANY NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____ 13



Dust got their goat at Amalgamated!

Pangborn rids plant of goatskin dust, gets higher production at lower cost.

Processing 25,000 goatskins daily created a serious dust problem for Amalgamated Leather Co., Wilmington, Del. Dust was so thick during the buffing operation that workers had to stop every half hour to clean up. Pangborn Dust Control solved this problem. The atmosphere during buffing is now clean. Workers do better, *continuous* work. Plant and machinery maintenance costs are lower. No wonder Amalgamated says Pangborn is "really doing a job"!

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Dry or Wet Dust Collectors can save you time, trouble and money!

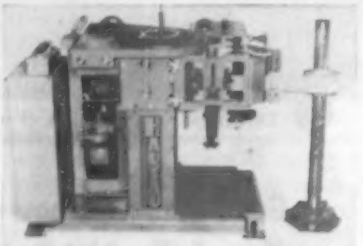
See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." Pangborn Corp., 2100 Pangborn Blvd., Hagerstown, Maryland.

Pangborn
CONTROLS DUST

FACTORY / EQUIPMENT NEWS
Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

91—Basket Container of expanded metal (steel) is for dipping and degreasing, as well as handling small parts. "Rantotes" in single hopper, front stacking; double hopper, front stacking, closed end stacking; nesting and stacking styles. *Randolph Industrial Equipment Co.*



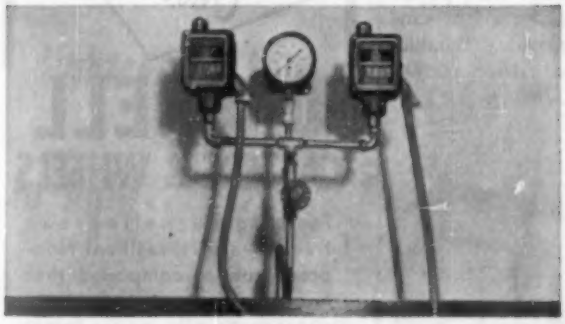
92—Stator Insulation Machine automatically forms and inserts insulation for the stators of electric motors. Accommodates all toothed stators to 20 hp., adjusting to different diameters, slots, depths in seconds. Actuation is all-mechanical. *Hautau Engineering Co.*

93—Pallet-Box is a lightweight, heavy-duty, steel unit that can be assembled or folded in less than 20 seconds; has no loose pins or parts. "Hamlintainer" weighs 180 lb.; has static capacity of 5000 lb. For handling, storage, shipping. *Hamlin Metal Products Co.*

Turn the page

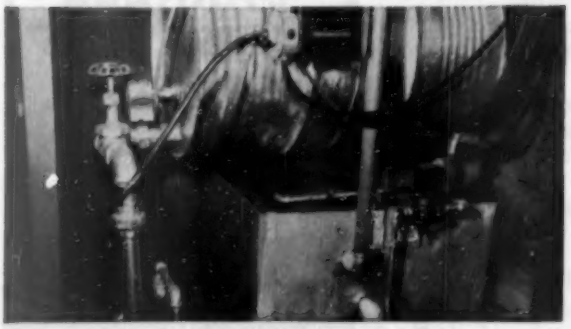
Power factor correction capacitors at Kansas City Power & Light are switched in when temperature changes . . . to compensate for air conditioning loads. Honeywell Industrial Thermostat on the utility pole does the job . . . at much lower cost than usual current control devices.

Honeywell Controller Cost $19.00*



Hosiery mill steam plant saves $1175 in fuel yearly by installing a pair of Honeywell Pressure Controllers, which make it easy and foolproof to switch from high pressures for peak production to low pressures for supplying night shift and weekend needs.

Honeywell Controller Cost $40.00*



Water consumption is reduced at Atwood Vacuum Machine Co., Rockford, Ill. A Honeywell *Aquastat* temperature controller and solenoid valve turns on a spray of tap water to reduce temperature of the coolant only when needed . . . with resultant decrease in water consumption.

Honeywell Controller Cost $12.50*

*Approx. cost. Prices subject to change without notice.

Honeywell Industrial Controls

Reduce costs

Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems

Cutting costs for materials, fuel or utilities doesn't always call for elaborate automatic control equipment. In scores of spots around your plant, you can effect substantial savings by putting simple, inexpensive Honeywell Industrial Controls on the job.

By regulating temperature, pressure, vacuum, liquid level or humidity, these versatile controls can help you avoid waste . . . reduce rejects . . . save manpower . . . prevent down-time. More than 7000 different models give you an unequalled variety from which to choose. They're simple, rugged and dependable . . . and cost surprisingly little. Readily applied to any kind of equipment, they can improve safety, protect quality of production, increase output and minimize maintenance in hundreds of different ways.

This comprehensive line of precision-made products is backed by the extensive application experience and world-wide service facilities of the largest manufacturer of controls. For a discussion of how they can be applied in your own plant, call your local Honeywell sales engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Peerless Packet Trolley Hoists simplify handling on assembly line

These integrated hoists and trolleys simplify handling of heavy parts on assembly lines. The worker just picks up the load, rolls it along an I-beam, lowers it on the bench top. Peerless Packet Trolley Hoists make lifting easy, require little maintenance. For more information about these time-saving and labor-easing trolley hoists, ask your authorized industrial distributor for Bulletin P-5. Or write us.

THE HARRINGTON CO.

Makers of Hoists Since 1876

GRAVERS ROAD AT THE TURNPIKE
PLYMOUTH MEETING 21, PA.

For more about these products circle item numbers on Reader Service card next to back cover.

94—Communication Units are for control of lift trucks, tow tractors, closed-system yard railroad engines, other drayage vehicles. Low power enables economical operation, simplified circuitry provides reliable, trouble-free service. *Allen B. Du Mont Laboratories, Inc.*

95—Bulk Bins need no special labor for fast set-up, expansion, disassembly, relocation. "Floating wedge lock" construction eliminates nuts, bolts, screws, erection welding, cross-bracing. Parts are interchangeable. Shelf holds 2000 lb. *Sturdi-Bilt Steel Products, Inc.*

96—Coil-Winder Drive, bench type, handles field, mush, armature coils to 5 hp., as well as solenoid, electromagnet, other small coils. Operates smoothly, with constant torque; positive stopping. Many large winder features. Weighs 60 lb. *Crown Industrial Products Co.*

Turn the page

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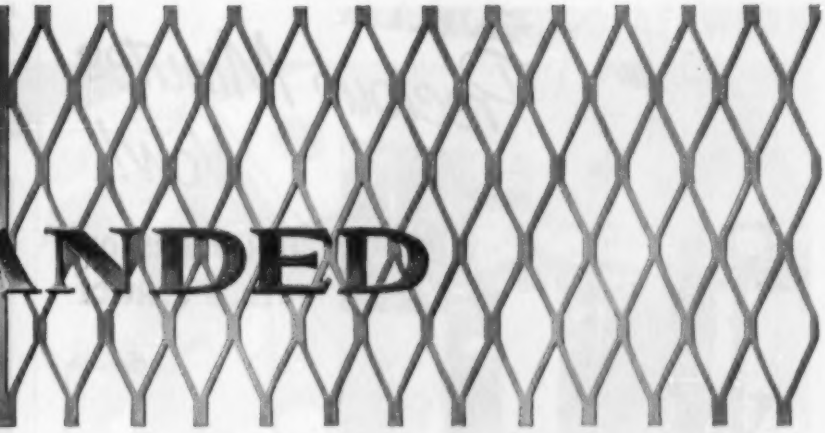
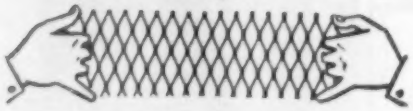
WHAT IS WHEELING EXPANDED METAL?

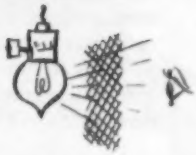
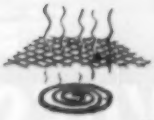
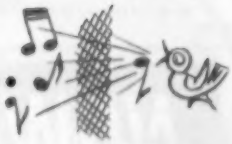


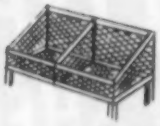
Solid Steel **...pierced** **...and s-t-r-e-t-c-h-e-d...**

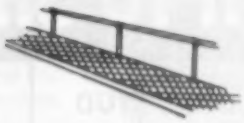


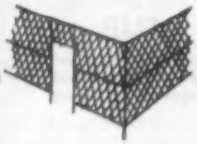
Stronger **per pound...**

lighter per foot... **Allows free passage...**

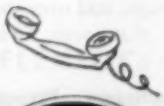
to light...  **heat...**  **sound...** 

and air... **Ideal for bins...**  **grills...**

railings... **walkways...** 

steps... **enclosures...**  **furniture...**

➡ It's the versatile metal of 1,001 uses! ⬅

Call  **or write** **for full details today** **!**

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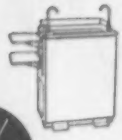

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Here, in our quality-control laboratory, an important routine check is being made to pre-determine thermostat efficiency. It is but one of many constant tests, using the very latest equipment, which assure that the various components of a Halsey Taylor Cooler meet the high standards of quality and performance we have established.

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FACTORY / EQUIPMENT NEWS

Begins on page 154

For more about these products circle item numbers on Reader Service card next to back cover.

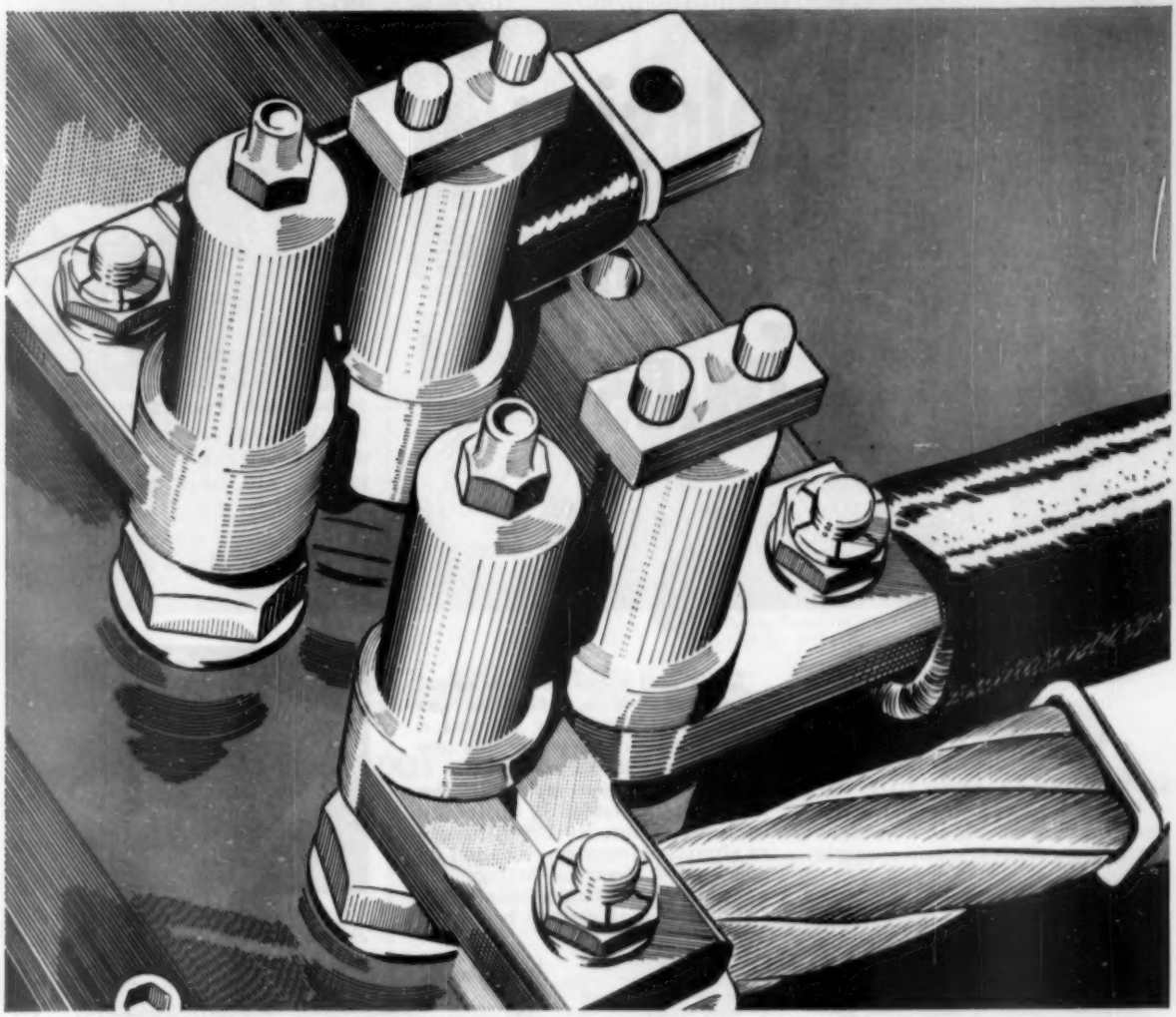
97—Insulation Impregnating Chemical, a moisture-proofing compound for windings of electrical motors, is now available in easy-to-use aerosol dispenser. Facilitates spraying of switchgear, housings, electrodes, etc. Fortifies against premature breakdowns. *Safe-T-Seal Div.*

98—Differential Relay operates on small voltage and frequency variations. Will "dropout" at 80-93% of "pick-up" with frequency held constant; smaller differentials obtainable. Protects against low- or over-voltage; and over- or under-frequency. *Automatic Switch Co.*

99—Diaphragm Pressure Switch senses pressure difference from 0 to 45 in. of water between variable and reference pressure, with fixed actuation value of 0.5 in. water. Actuates circuit on increase or decrease of predetermined pressure difference. *Barksdale Valves.*

Turn the page

FLEXLOC AT WORK



DESIGNER OF WELDING DIE uses one-piece, all-metal thin FLEXLOCs as stop nuts on flexible cable assembly. Although the assembly swivels, FLEXLOCs won't work loose.

Nuts that loosen cause trouble. Contact is poor; flow of current erratic; welding faulty—and faulty welding means inferior finished jobs.

Don't take any chance of nuts loosening on vital assemblies. FLEXLOCs are made to stay put. And they are available in a wide range of sizes, types and material. See your authorized industrial distributor for Bulletin 866 and samples. Or write STANDARD PRESSED STEEL CO., Jenkintown 11, Pa.

• • •

Use FLEXLOCs anywhere safely

ON ROUGH BOLTS. They'll smooth out bolt threads without damaging the threads of the nut.

IN TEMPERATURES TO 550°F in plated nuts and even higher in unplated ones. High temperatures do not affect FLEXLOCs. Nuts with non-metallic inserts fail under such conditions.

AS STOP OR LOCK NUTS. After at least 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC stays put.

REGARDLESS OF MOISTURE, OIL, DIRT OR GRIT. None of these conditions make any difference to a FLEXLOC, and vibration won't loosen it.

FLEXLOC®
LOCKNUT DIVISION
sps
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Explosion Proof Twins!

COMPLETELY Explosion-Proof!

Yes, this is the *first* industrial vacuum cleaner which combines portability, efficiency, and *complete safety*.

The MULTI-CLEAN H-500 EXPLOSION-PROOF Vac has been tested by UL and approved for use in Class I, Group D and Class 2, Group G locations.

This now means that you can use this wet-dry vac amid gases, vapors, dust, and in dozens of other situations where danger of explosion or fire had previously made use of a vac too risky.

It's ideal for cleaning floors, walls, overhead pipe, machinery or stock bins where there is grease, chemicals or other flammable materials. And since it works equally well for wet or dry pickup, it's just the thing for cleaning material from storage tanks.

Mills and elevators, chemical plants, petroleum refineries, gas plants, and distilleries are just a few of the locations where this new vac is especially suited.

For more information on the H-500, its powerful ⅛ hp totally enclosed motor, its 100% bronze or aluminum construction, and its spark-proof electrical fittings . . . see your local MULTI-CLEAN Distributor or mail coupon below.

MULTI-CLEAN *Explosion-Proof* Machines are engineered for scrubbing, cleaning, buffing, and polishing in presence of combustible gases, liquids, dust. Available in 14" and 16" sizes.

Multi-Clean Explosion-Proof Floor Machine

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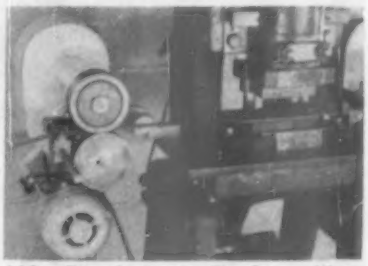
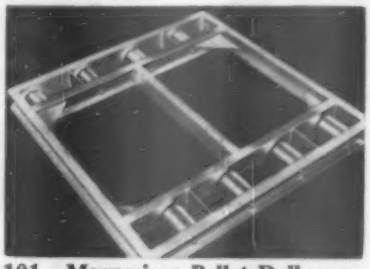


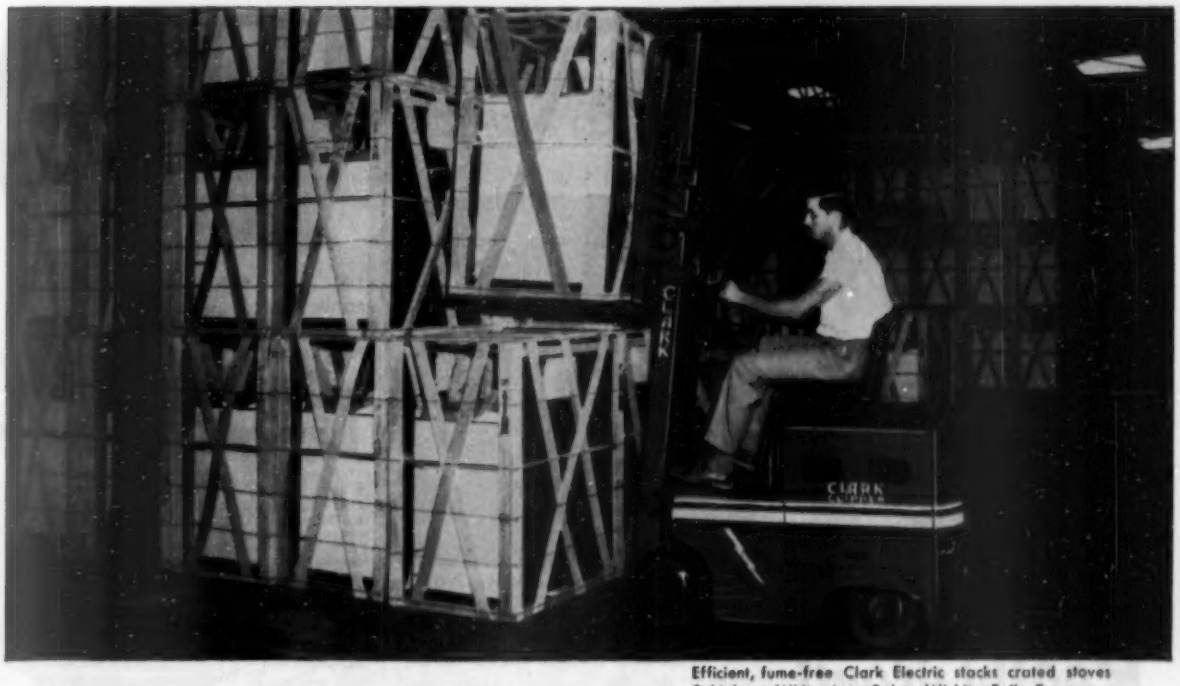
100—Punch Press Feeder utilizes self-powering principle, eliminating die damage from doubling up stock. Handles coil, strip, stock. Operates from left to right, right to left, or front to back. Inexpensive unit is simple to install and operate. *Flex-Feed Co.*



101—Magnesium Pallet Dolly provides maximum strength at minimum weight. Units weigh 31-42 lb., depending on size; facilitate quick, efficient manual positioning. Six standard sizes in capacities of 2000 or 4000 lb.; roller spacing even or staggered. *Magline, Inc.*

102—Fluorescent Lamp Ballast has lowest case height in its rating, says maker. Instant-start unit for two 8-ft. or 6-ft. lamps allows reduction in an over-all fixture height of more than ¾ in. Weight of ballast has been reduced 10%. *General Electric Co.*

Turn the page



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Clark's exclusive dual field motor offers minimum amperage draw. External resistance is utilized only in the first two points of power, thereby eliminating wasteful power losses and overheating. Result! Your battery works a longer cycle . . . your equipment does more work.

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Write for the booklet "Electri-Facts" showing cutaways of the power train, control circuit, hydraulic system, and other important components.

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Really draw!

A size and model to solve any dust collecting problem, Torit collectors provide complete, all-around dust control. Torit collectors are unitized for custom installation on each machine, giving power and suction only when machine is operating. Keeps plant and machines free from clogging and unsightly dust. Furthermore, cleaned and filtered air is exhausted back *into* the room maintaining heat balance. Find out now how Torit unitized dust control is engineered to your problems.

See our catalog in Sweet's Machine Tool File, or write:

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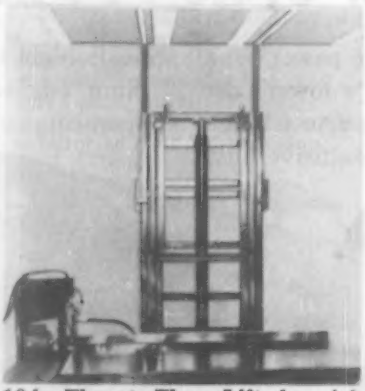
MANUFACTURING CO.
297 Walnut Street • St. Paul 2, Minn.

For more about these products circle item numbers on Reader Service card next to back cover.

103—Self-Cleaning Spray Nozzle for central-system air conditioners won't clog, regardless of amount of lint, other fine foreign matter in air. Special flexible orifice "spits out" obstructions. "Cant-Clog" made in standard sizes for easy replacement. *Carrier Corp.*



104—Floor-to-Floor Lift does job of freight elevator in small space, at low cost. Shipped in three parts, installed in one day. Operates on 115-volt, single-phase motor. Lifts 750 lb. Automatic stop, overloading safeguard, other safety features. *Florlift Corp.*

105—Abrasive Wheels for portable grinders feature safety web backing of spiral wound rayon auto tire cord for extra strength and safety. Outlast cloth discs 40 to 1, says maker. It's ideal for rough, tough production jobs — such as grinding welds, removing flash and bead, etc. *Simonds Abrasive Co.*

POWER Breakdowns need not be costly!

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Emergency Katolight POWER PLANT

Vital electrically operated equipment can continue to function in spite of power failures when your plant is Katolight equipped. Katolight Units are available in standard sizes up to 50 K. W. Adaptable to engine of your choice. Also A. C. Generators to 400 K. W., Motor Generator Sets, Rotary converters and Motors.

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Always Better
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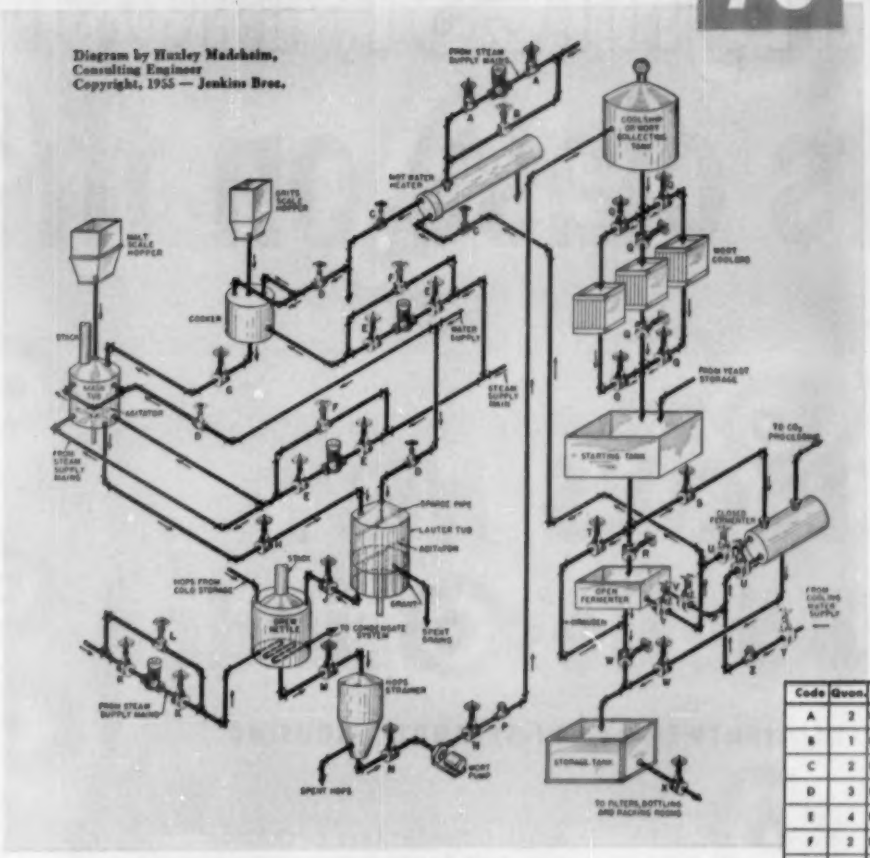
JENKINS PRACTICAL PIPING LAYOUTS 76



How to plan piping connections for a GRAVITY-FEED MULTIPLE-STORY BREWERY

This piping layout is typical of installations in many breweries designed for gravity-feed processing, and the principal operations are briefly outlined.

Corn grits are cooked with water in the cooker, with enough added malt to convert and liquefy the grits. When the malt, which has been mixed with water in the mash tub, is properly steeped, the finished cook is dropped into it and the resulting mash thoroughly mixed.

Pumped into the Lauter tub, the mash grains settle to form a filter bed, from the bottom of which the clear liquid containing fermentable and unfermentable sugars is drawn. Extraction is increased by "sparging" with hot-water spray. This liquid, the "wort", flows by gravity to the brew kettle.

In the brew kettle, the wort is boiled with hops to add flavor and to clarify and preserve it. The hops are then strained off, and the liquid is pumped to the "coolship" tank to settle. It then goes through coolers to reclaim most of the residual heat, and on to the starting tank.

In the starting tank, the yeast is added, and the mixture flows to the fermenters, some of which are closed to collect the carbon dioxide gas for future use. After fermentation, the beer is cooled again and sent to storage tanks for eventual bottling and racking.

Consultation with accredited piping engineers and contractors, experienced in brewery design, is recommended when planning any phase of the various processing systems.

To simplify planning, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information.

VALVE RECOMMENDATIONS
For details of valves to suit varying conditions see Jenkins Catalog.

Code	Quan.	Jenkins Valve	Service
A	2	Fig. 275 Bronze Gate	Shutoff steam to heater
B	1	Fig. 556-P Bronze Globe	Bypass to heater
C	2	Fig. 47 Bronze Gate	Shutoff water heater
D	3	Fig. 106-A Bronze Globe	Continuous water flow
E	4	Fig. 204 I.B. Gate	Process steam shutoff
F	2	Fig. 576-P Bronze Globe	Bypass water valve
G	1	Fig. 677-A Bronze Gate	Shutoff cooker mash
H	1	Fig. 677-A Bronze Gate	Shutoff finished mash
J	1	Fig. 677-A Bronze Gate	Shutoff wort to kettle
K	2	Fig. 204 I.B. Gate	Shutoff steam to kettle
L	1	Fig. 576-P Bronze Globe	Bypass to kettle
M	1	Fig. 677-A Bronze Gate	Shutoff wort line
N	2	Fig. 677-A Bronze Gate	Pump shutoff
P	1	Fig. 352 Bronze Swing Check	Prevent backflow
Q	6	Fig. 677-A Bronze Gate	Shutoff coolers
R	1	Fig. 677-A Bronze Gate	Shutoff open fermenter
S	1	Fig. 677-A Bronze Gate	Shutoff closed fermenter
T	3	Fig. 677-A Bronze Gate	Krausen line
U	2	Fig. 675-A Bronze Gate	Water to closed fermenter
V	2	Fig. 675-A Bronze Gate	Water to open fermenter
W	2	Fig. 677-A Bronze Gate	Shutoff storage
X	1	Fig. 677-A Bronze Gate	Shutoff rack & bottling
Y	1	Fig. 675-A Bronze Gate	Shutoff well water
Z	1	Fig. 352 Bronze Swing Check	Prevent backflow

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LOOK FOR THE JENKINS DIAMOND
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SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

the lightest, most in its class, on the

CLECO'S NEW 2000 Series Grinder

WITH THE LIGHTWEIGHT, HI-STRENGTH HOUSING

Now, a 6-inch pneumatic grinder by Cleco that offers *more* power, safety, versatility, and dependability than any other grinder in its class on the market today.

Let us demonstrate these outstanding features in your plant:

GREATER POWER—A demonstration on your air lines will prove the extra power of the Cleco 2000.

LIGHTER—Weighs only 10½ pounds (without guard); over-all height, 7⅞"; lightweight design embodies hi-strength magnesium housing.

MAXIMUM OPERATOR SEE-ABILITY—Standard revolving safety guard for flanged cup wheels or optional cut-away wheel guard, which gives operator full view of work at all times.

EASIER, SAFER OPERATION—Sensitive snap handle gives operator instantaneous throttle control *while he maintains a full grip.*

MORE COMFORTABLE OPERATION—Three-position dead handle adjusts to suit the operator. Muffling device at air discharge reduces noise.

MORE VERSATILE—Throttle valve can be changed from snap handle to wing nut without changing handle. Speed settings available at either 4,500 rpm or 6,000 rpm.

LONGER LASTING—New built-in oil-mist lubricator injects a fine oil spray *while the motor runs.* Graphite-impregnated rotor blades, specially designed governor bearings, and a ball-type inlet valve extend the Cleco 2000's service-free life.

MORE DEPENDABLE—Factory-locked governor prevents tinkering or faulty setting by the operator, yet is easily adjusted by your repair shop without time-consuming disassembly and reassembly between tachometer tests.

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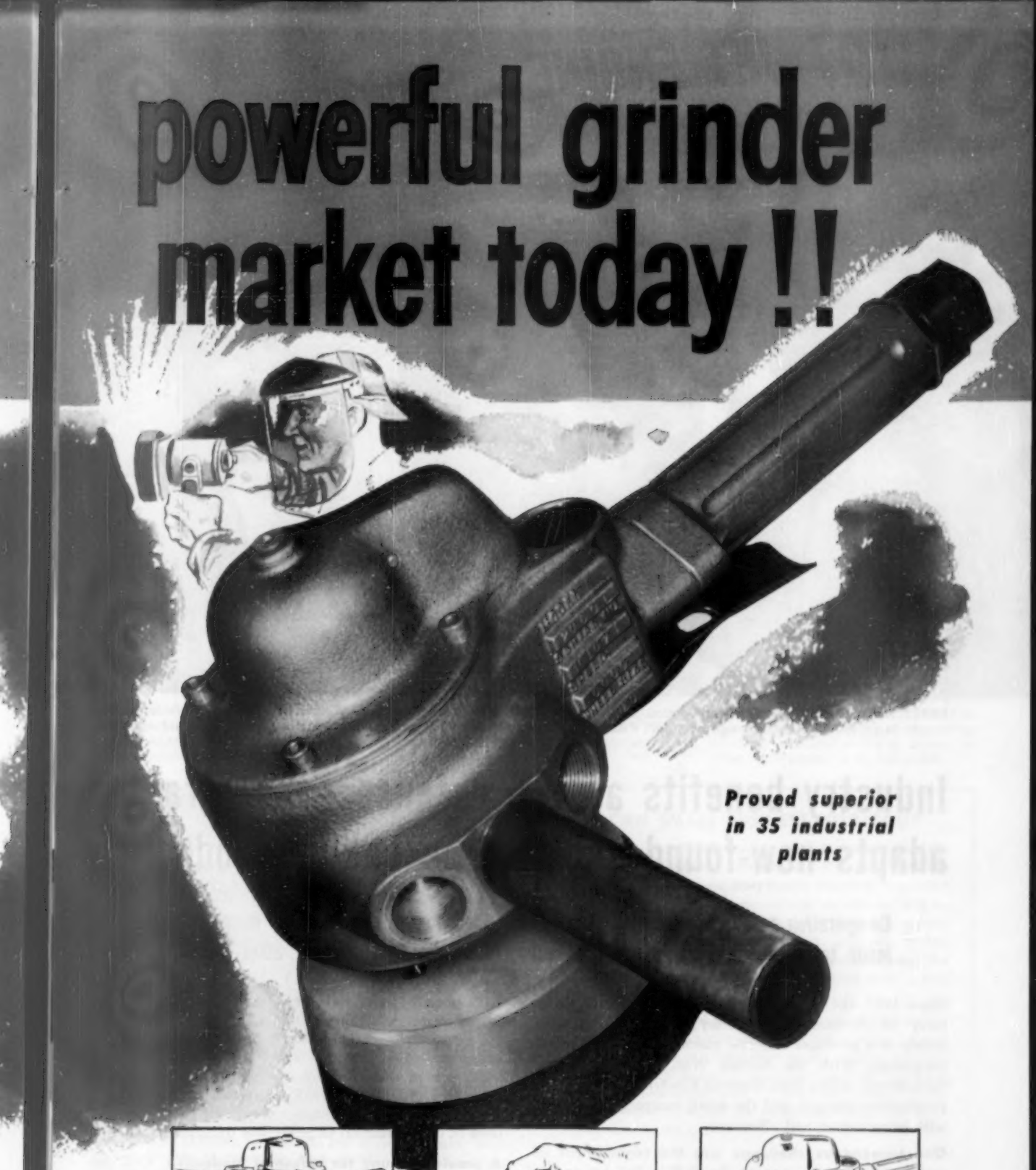

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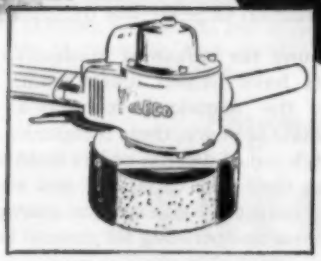
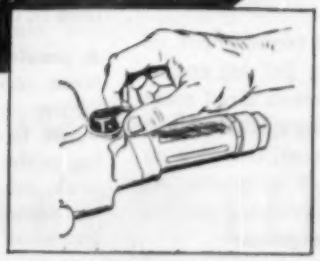
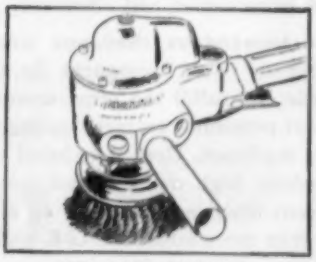


OPTIONAL CUT-AWAY WHEEL GUARD



OPTIONAL WING NUT THROTTLE VALVE



WIRE BRUSH ATTACHMENT

EARLY JOB PLANNING preceded production of the G-E J47 nozzle. Here, David Nelson, design engineer; Felix Scopelliti, production manager; William F. Steinen, president; and Ernest Tedesco, quality control director, discuss contract.

Industry benefits as G-E defense subcontractor adapts new-found skills to peacetime production

Co-operation on defense jobs between General Electric and small Newark business firm leads to new machine designs and techniques—now available to other industries

Since 1907, the William Steinen Manufacturing Company of Newark, New Jersey, had been growing slowly as a producer of screw machine parts and metal stampings. With the Korean War, however, defense subcontract orders from General Electric required swift production changes, and the small company responded with imagination and efficiency.

One tremendous challenge was the requirement of extremely close tolerances for G.E.'s J47 jet engine nozzle. To fulfill the requirement, Steinen hired more expert personnel, enlarged its engineering staff, designed new machines. Result: reduced unit cost, delivery on schedule, high quality, and more G-E contracts. At present Steinen is engineering and developing nozzles for even more advanced G-E engine projects.

With growth came new abilities. Exacting G-E contracts meant much more than a greatly increased employee roster and added machines. It meant the development of new skills, versatility, and capacity. And today—even though Steinen sales will hit an all-time high of $1,900,000 in 1955—less than 10% of this is defense work. The company has smoothly switched the bulk of its production to peacetime industrial needs.

A proving ground for industrial production. G-E defense contracts have helped many small businesses "grow up" to the American economy's expanding needs. In a climate of peace, these companies are adapting to the stretch-out of defense orders from the Korean peak, matching their new capacities and standards to the demands of industry—an excellent example of large and small business co-operating for mutual benefit. 649-4

TRIPLED PRODUCTION resulted from this Steinen-built machine which cross-drills three wiring holes in jet nozzle bodies at one time, instead of singly.

ELIMINATING A SLOW HAND OPERATION, and reducing costs, this machine was specifically designed by Steinen for precision reaming of holes in jet nozzles.

MODERN PACKAGING developed by Steinen utilizes clear plastic tube in which nozzle assemblies have high visibility, and are easily selected.

SWIFT GROWTH required expanded accounting and purchasing department. William Steinen, Sr., (in vest) founded company forty-eight years ago.

VOLUME PRODUCTION on short notice is possible at Steinen because a large variety of metal stocks is always on hand in company's storage areas.

EXHAUSTIVE TESTING, such as this test of nozzle's spray angle, enables Steinen to meet the rigid standards set by General Electric and other prime contractors.

CAN SMALL BUSINESS HELP YOU?

Thousands of small businesses, like the William Steinen Mfg. Co., have furnished General Electric with practically every kind of skill and services as defense subcontractors and suppliers. Many of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you with your production.

If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you. Write to C. W. Bryant, Manufacturing Services Division, General Electric Co., 570 Lexington Ave., New York 22, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc., Member, New York Bar

Got These Benefit Troubles?

Both retirement and sick leave can pose sticky problems for any employer. But forewarned is forearmed.

These popular fringe benefits may get you into trouble—unless you've figured out all the angles in advance. Here are four cases that will help you set your policies.

Compulsory retirement — Arbitrator Joseph Shister ruled in one case that an employer could compel an employee to retire at age 65 . . . despite the fact he wasn't eligible for a pension and the union contract said nothing on the subject of retirement. The union was well aware of the company's retirement policy. Had acquiesced in other compulsory retirements, explained Shister.

However, in another case Arbitrator Arthur Ross ruled against it. Ross found in his case that the union had always opposed the policy. Compulsory retirement violated job security—which was provided for in the contract, he said.

A recent Circuit Court of Appeals decision taught the Ford Motor Company this lesson: If an employer wishes to arbitrarily retire an employee at a set age—say 65—he must be sure that his pension plan contains a compulsory-retirement-at-age-65 clause and . . . that all employees are aware of the provision when they join a plan. And if a union is involved, it is desirable for the union to agree to or ratify the plan. The Court ordered Ford to pay back wages to an employee who was retired at 65 against his will . . . he claimed that neither he nor his union was told of the compulsory retirement provision. *(United Protection Workers v. Ford)*

Sick leave isn't vacation—Oddly, there aren't many arbitration cases on this point. In fact, this is the first we've noticed. You'd think there'd be more.

The question: Are employees out on sick leave when a plant vacation is called entitled to both vacation pay and disability benefits?

Under the contract, the Toledo Scale Company of Rochester, N. Y., reserved the right to have employees take vacations at shutdown time if the company considered that "conditions made it desirable." The contract also required the employer to consider requests for particular vacation periods—but this, he claimed, was over-ridden by the need for the shutdown vacation period.

The arbitrator ruled that the employees on sick leave during the vacation period should receive their disability benefits — in full. And that they should be permitted to pick a different time for their vacation periods.

Plant Access for Union Business

The "no-man's land" for unions gets smaller with each decision of the National Labor Relations Board. Time was that payroll, promotion, merit-rating and similar information were verboten — to the union. But not any more, according to many Board opinions.

But encouraing in this picture is the recent denial by the NLRB of the union's right to send representatives into a plant of Westinghouse Electric to make an on-the-job analysis of an employee's duties.

The employee had complained. Claimed he was entitled to a higher classification bceause of "special assignments" handed him. The grievance had travelled part way up the ladder when the union made its request.

Three board members denied the request. One of the three reasoned that the union hadn't shown that the refusal denied it the data necessary in processing the grievance. Another: Production might be hampered if access was granted. The third: No prior cases allow the union to run its business in the plant.

But there was a dissent by the two other Board members. This type of a decision makes it anybody's ball game.

Firing Workers at Union Request

Stop, look, and beware before you fire an employee because the union asks you to. If you don't fire him, you may have trouble with the union. If you do, you may get in trouble with the law. Here's a case that illustrates this. You may wish to tuck it up your sleeve to lay out on the table at the right time.

This union suspended a steward because he encouraged a wildcat strike—in fact, prolonged it. His action caused the wrongful suspension of a foreman. In addition, he secured his journeyman's card falsely and fraudulently. Certainly good reasons for an employer to say yes when the union demands his discharge. But the National Labor Relations Board didn't think so. The employer knew that the worker had lost his union card for other reasons than because he failed to pay his initiation fees and dues. This was a violation of law. *(Multi-Hydromatic Welding)*

Company Hospitals

Run a hospital in your plant? You can forget about complying with the Federal minimum wage and overtime regulations if the hospital is open to the public, and hospitals

"JOB-FITTED COMBINATION SCRUBBER-VAC

PUTS FLOOR-CLEANING ON PRODUCTION BASIS *throughout our plant"*

— *Says* Superintendent of Maintenance
VICTOR ADDING MACHINE COMPANY, CHICAGO

...in the Tool Room

...Punch Press Room

...Cafeteria and other areas

Victor Adding Machine Company insists on maximum production in floor-cleaning as well as in manufacturing. Like other *production-wise* industrial concerns, *Victor* cleans floors with a *Job-Fitted Combination Scrubber-Vac!* This single unit

Completely Mechanizes Scrubbing

—applies the cleanser, scrubs, flushes if required, and damp-dries the floor—*all in one operation! Job-fitted* to specific needs, a *Scrubber-Vac* provides the maximum brush coverage consistent with the area and arrangement of the floors.

Model 213P, shown in illustrations at left, is designed for heavy duty scrubbing of large-area floors. It has a 26-inch brush spread, and cleans up to 8,750 sq. ft. per hour! *Finnell* makes still larger sizes—in *gasoline* as well as *electric* models—and also sizes for smaller operations. From this complete line, you can choose the *Scrubber-Vac* that will put *your* floor-cleaning on a production basis and reduce labor costs. And you can lease or purchase the machine. Maintenance men like the convenience of working with a *Scrubber-Vac*. This *all-in-one* unit is *self-propelled*, and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly.

In keeping with the *Finnell* policy of rendering an individualized service, *Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you* to help solve your particular floor-maintenance problems . . . to train your operators in the proper use of *Finnell Job-Fitted Equipment* . . . and to make periodic check-ups. It's also good to know that *Finnell makes everything for floor care!* For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2512 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.
Originators of Power Scrubbing and Polishing Machines

Everything for Floor Care — FINNELL

BRANCHES IN ALL PRINCIPAL CITIES

WITH STRATOFLEX

Hose and Fittings

Making up hose assemblies in your own shop or in the field often saves valuable time. The cost of replacing hose lines can be drastically reduced by installing new STRATOFLEX Hose and reusing the detachable fittings. It pays to keep on hand a supply of STRATOFLEX Hose and reusable Fittings. Order from your dealer or write for Bulletin S-2.

1. Cut hose to length

2. Screw on socket

3. Oil inside and insert assembly tool

4. Screw swivel nipple or male fitting into socket and remove tool

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Begins on page 222

other than your own are available to your employees.

But go easy if you have a strictly in-plant dispensary or first-aid room. Employees in this operation may be covered by the wage-hour law. Rulings haven't set a definite precedent, however. The final answer will depend on how the courts look upon it.

Protected Activities of Non-Union Workers

Non-unionized employers can also violate the National Labor Relations Act. They can do so by committing an unfair labor practice during an organizing campaign. And they can do so by merely punishing employees irrespective of an organizing campaign. In this case, four employees stopped their machines to talk to the boss about the discharge of two fellow-workers. The machines were down about an hour. The employer disciplined them by a layoff. The NLRB said this was an unfair labor practice. The employees were engaged in a protected concerted activity.

New Laws on Anti-Discrimination

There'll be less discrimination for race, color, creed, and national origin in the United States in the year 1956—if several new state anti-discrimination laws are effective.

These states just adopted or amended anti-discrimination laws:

. . . *Minnesota and Michigan*—adopted an enforceable law—the 11th and 12th state to do so.

. . . *Arizona*—its new law binds public employers and contractors only.

. . . *Massachusetts* — insurance and bonding companies cannot inquire about race, creed, color, national origin, ancestry in connection with employment bonds.

. . . *Washington* — the present board is authorized to order restoration of losses to all discriminated persons.

. . . *Connecticut*—no help-wanted ads restricting employment because of race, color, religion, national origin, ancestry.

Work-Sharing or Layoff?

When sales drop off, work-sharing may seem to be the fairest way of handling reduced production requirements. Gives some work to everyone and keeps skilled workers on the payroll.

But you can't always do this. For example, the Preferred Utilities Manufacturing Company of Connecticut cut the work week to four days when things got slow. Justified its action when it was called before a Board of Arbitration by pointing to the management rights clause in the union contract. The arbitrators, however, pointed to the clause providing layoffs on a seniority basis and ordered the company to give the day's lost pay to the senior employees who lost out by work-sharing.

This may not always be the rule. Take this arbitration case that came up in Dayton, Ohio, involving the Nolte Brass Foundry Company. There the arbitrator ruled that work-sharing during slack season was okay. In the absence of a specific clause against work-sharing, the seniority clause doesn't count.

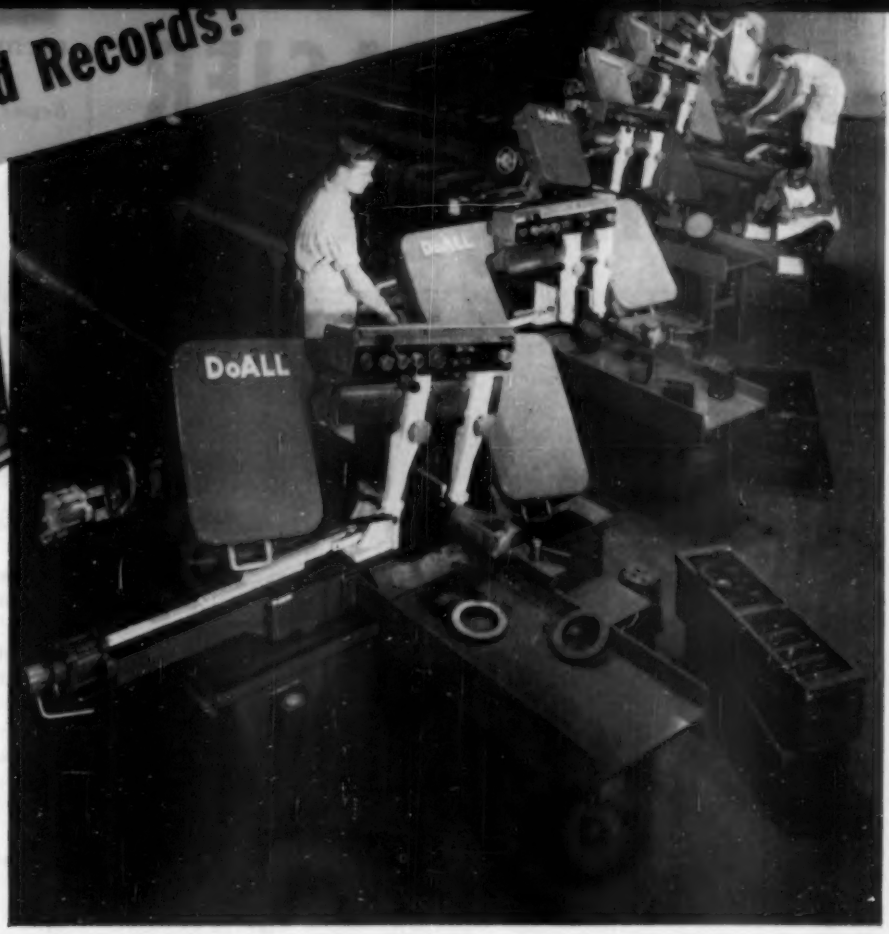
BRIEF BUT IMPORTANT

Strikers can't knock product. There was a strike at the Patterson-Sargent Company, Cleveland paint manufacturer. Six of its striking employees warned customers to stay away from paint manufactured by the non-strikers. They lacked the proper know-how. The six were fired and the discharge was upheld by an NLRB Trial Examiner.

Guaranteed quit notice. Short notice of an employee's intent to quit wrecks production schedules. As part solution in Hawaii, an employer retained part of a worker's wage to be forfeited as liquidated

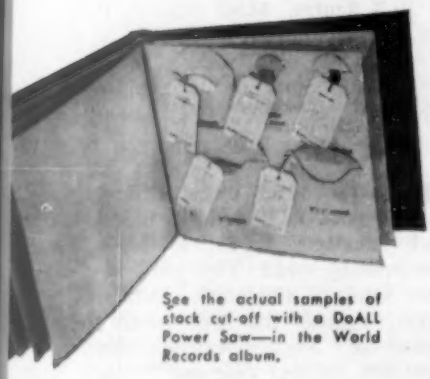
Making World Records!

Ask the DoALL man to show you the World Records Album containing actual performance data on DoALL cut-off sawing



. . . FASTEST SAWING IN THE WORLD

Faster than any power hack saw . . . Faster than any other band machine . . . Faster than any cut-off saw of comparable size and price in the world!



See the actual samples of stock cut-off with a DoALL Power Saw—in the World Records album.

The new DoALL Automatic Power Saw cuts up to 15 square inches per minute on ferrous metals. Saves time, labor and *material*. Cuts cut-off costs 50% or more. Just look at these world records!

Material	Area/Cut (Sq. in.)	Brinell Hardness	Sawing Time/Cut	Sq. In. Per Min.	Tool Life
2" Round C-1018	3.14	150	20 SEC	9.42	3000 Pieces
8" x 8" "H" Structural Steel	10.140	—	1.27 Min	8.30	500 Pieces
5" Round B-1112	19.63	125	1.28 Min	15.06	700 Pieces
6" Round Titanium Type 140-A	28.27	310	35.46 Min	0.832	20 Pieces

CONSTANT FEED PRESSURE—the operator sets feed pressure and then automatic regulation maintains uniform pressure at all points throughout the cut.

FACTORY-SET BLADE TENSION—another DoALL feature that *automatically* keeps blade at correct tautness for maximum production and tool life without reliance upon the operator.

INFINITELY VARIABLE SPEED—from 60 to 350 FPM, together with adjustable, self-regulating feed control provides the maximum cutting rate for any job.

FULLY AUTOMATIC—with power feed table and automatic indexing DoALL Power Saws "run themselves". Standard stock indexing adjustment to 24"; greater lengths also available. Nesting clamps available for multiple bar stock or tube cut-off.

See the world records. Call your local DoALL Service Store, or write:

THE DoALL COMPANY

254 N. Laurel Ave., Des Plaines, Ill.

"Makers of machines and blades—they go together"

PS-4

FRIENDLY DoALL STORES . . . (in 37 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

Band Machines . . . Surface Grinders . . . Measuring Instruments

Saw Bands . . . Surface Plates . . . Cutting Tools In Stock

FASTER, EASIER SCHEDULING!

Free literature shows how McCaskey Machine Control Board simplifies machine loading, scheduling, dispatching, job assignments

The compact, adaptable unit shows work ahead for each machine or man, keeps work orders in sequence. Adjusts for schedule changes eliminating revision of lists, records and delays between planning and dispatching. Assures operation on schedule. Effective in production, assembly, maintenance or engineering.

We can show you how others have used McCaskey Controls successfully and economically. Let us send you the complete facts.

McCASKEY INDUSTRIAL CONTROLS

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Please send me free literature on how McCaskey Machine Control Board simplifies machine loading, scheduling, dispatching and job assignments.

Name .....

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Begins on page 222

damages—if he quit without 12 days' notice. It's okay under the law, said the Attorney General.

Declares SUP won't become UAW's GAW. Malcolm L. Denise, General Industrial Relations Manager for Ford, promises that his company's SUP (Supplementary Unemployment Compensation) plan will not end up as the GAW demanded by the UAW. We'll take a strike of "indefinite duration first," he said.

Board ballot decides teamster's grievances. Grievances coming up under contracts signed by Local 707 of the AFL Teamsters and the trucking outfits affiliated with the Empire State Highway Transportation Association will be decided by a nine-man board, four from each side and an impartial chairman. Vote is by secret ballot.

Which employment figures do you read? Employment figures put out independent of each other by the BLS and Census Bureau do not jibe, according to the CIO. For example, census figures for non-agricultural employment in July 1955 were 57.3-million. BLS figures for that month were 49.5-million. The CIO prefers the BLS figures. More reliable, it says. For a complete discussion of relative worth and validity, read "The Inside Story on Unemployment Statistics," FACTORY, February 1955.

Unions sued for illegal strikes. Damage suits to discourage illegal work stoppages appear to be a strengthening trend. Two most recent: Simmons Company, mattress maker, against the Upholsterer's Union of North America—for $500,000 . . . and Yale and Towne versus Local 1717 International Association of Machinists — for $1,500,000.

Minors needn't walk upstairs. As now amended, Secretary of Labor's Hazardous Occupation Order No. 7 allows working minors between 16 and 18 years old to ride on freight elevators or manlifts . . .

Flabbergasted!

"Yes sir, that's what I was—flabbergasted! Never dreamed that we had so much of our production investment tied-up in metal cleaning and surface preparation operations. What started the whole thing off was when the Detrex man pointed out to me that in the average metal working plant ¼ to ⅓ of all the operations are metal cleaning or surface preparation. I could hardly believe it at first, but when I checked our plant—sure enough, 30% of all our operations were of that nature.

"Naturally I began to pay a little more attention to that phase of our operation and the equipment and chemicals that went into it. It seemed like a mighty good spot to try and reduce some of our manufacturing costs. So I took some time to talk to a Detrex technician and, after he had studied our operation, he came up with some down-to-earth recommendations that really made sense. I was quite surprised to learn how extensive their line of equipment is. They have all kinds and sizes of degreasers, washers and sonic cleaners. In fact, whatever you want to do in the way of metal cleaning or surface preparation, they've got the equipment to do it. And they make the chemicals, too!

"As a result of the survey of our plant and the recommendations Detrex made, we've realized some important reductions in our manufacturing costs. I feel sure that the same thing could probably be done in other plants, too. So I'll make a suggestion. Next time a Detrex man calls on you, why don't you ask him to survey your operations? He isn't going to charge you anything for that service and chances are you'll realize some savings, too. If you're like me, you probably didn't know that you could get such a survey without a cash outlay. Well you can, and the Detrex technicians are real experts in their line. When they make a survey it's factual and the recommendations are sound. You'll find, like I did, that it's time well spent."

Service with a Saving!

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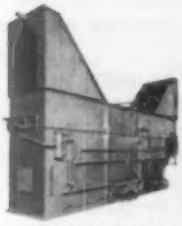
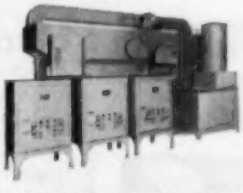
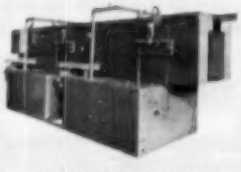
DEGREASERS • DEGREASING SOLVENTS • WASHERS ALKALI & EMULSION CLEANERS • DRYCLEANING EQUIPMENT • PHOSPHATE COATING PROCESSES



VAPOR-SPRAY-VAPOR DEGREASER



CROSSROD CONVEYORIZED SONICLEAN® DEGREASER

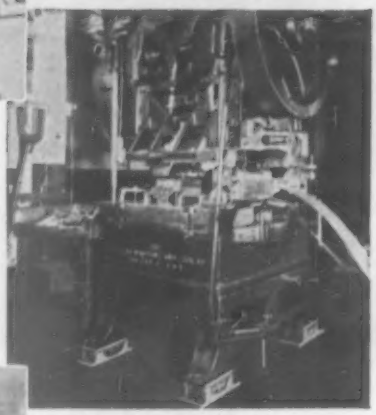


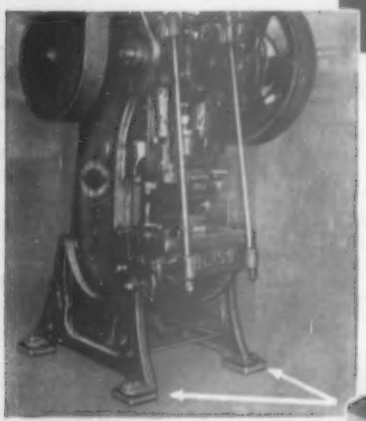
CONVEYORIZED MULTI-STAGE WASHER

MANUAL OPERATED SONICLEAN® DEGREASER

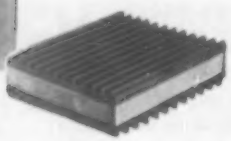
STOP VIBRATION *with* KORFUND VIBRATION CONTROL

A TOUGH PROBLEM solved by specially designed Korfund Steel Spring Vibro-Isolators. Shock from this 100,000#-600 ton capacity press was cracking building walls. Four specially designed 25,000# capacity Korfund Steel Spring Vibro-Isolators, themselves weighing 600# each, were installed under the press. Building damage stopped and heavy production schedules were maintained. Yet, the price of the special Korfund Isolators was less than 3% of the press cost.





AN AVERAGE PROBLEM—typical of those solved every day by Standard Korfund Steel Spring Vibro-Isolators. Vibration and noise from this double crank press, which could be felt and heard throughout the building, were stopped by Standard Korfund Steel Spring Vibro-Isolators. More and more manufacturers are discovering how Korfund Vibro-Isolators permit press installation without reinforcement of floors, permit press installation anywhere (even near precision equipment) for better plant layout, increase press speed and production, improve quality.



A SIMPLE PROBLEM solved inexpensively and effectively by Korfund Elasto-Rib Pads. In this case, Elasto-Rib Pads installed under each of the legs of this press stopped transmission of vibration and noise. For the less critical installation, Korfund Elasto-Rib Pads provide low-cost, effective vibration and noise control, and eliminate bolting to the floor.

PUNCH PRESSES are notorious for the amount of vibration and noise they transmit—yet in the three cases illustrated, Korfund Vibration Control units successfully solved the problem. In our files are scores of case histories describing equally satisfactory installations on many other types of machinery.

A selector chart is available giving recommendations for various vibration control problems. Write for your copy of Bulletin No. 13, or see our catalog in Sweet's Files.

For specific recommendations, contact us or the Korfund representative you'll find in most principal cities. A half-century of experience is at your disposal.

THE KORFUND CO., INC.

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FACTORY / LABOR RELATIONS NEWS

Begins on page 222

if they are operated by an assigned attendant.

Skilled worker shortage to continue. The nation faces a serious shortage of skilled workers, warns Labor Secretary James P. Mitchell. Out of a 67.5-million work force, there are only 9-million skilled employees. His solution: Better training and retraining . . . hire workers over 45 . . . and put an end to racial discrimination.

Aids to retirement preparation. Executives who appreciate the need for counseling their older employees about the problems of retirement—but do not have the time or the personnel to do anything concretely, may find that the National Association for Mental Health, a private group, may have a helpful idea. This association has prepared a series of four-page letters for mailing to employees over 50. The letters discuss major problems employees must meet and solve after retirement.

You be the Arbitrator

Begins on page 122

THE AWARD: The arbitrator pointed out that the contract gave management the right to take back the merit increase where an employee was no longer doing excellent work. He found nothing in the contract to prevent such reductions where falling-off of production was caused by transfer to new work, provided the transfer could be justified on business grounds. As this was admittedly the case with Barbara, the grievance was denied.

CAUTION: *The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.*

JERVIS B. WEBB

CONVEYOR ENGINEERING, MANUFACTURE, INSTALLATION and AUTOMATION

Webb Trolley Conveyors automatically transport parts and sub-assemblies to final assembly line.

MATERIALS HANDLING...

42 rollover and turntable stations, designed by Webb, index blocks 90° or 180° for machining operations.

Automation at Plymouth

Four miles of Webb Trolley type overhead transport conveyors have given the new Plymouth engine plant a higher degree of efficiency than they have ever had before. In engineering the layout for the new plant, Plymouth's goal was to achieve flexible and continuous production flow with a minimum of manual handling. Webb custom-engineered conveyor systems . . . 26 conveyor lines . . . have provided the answers for Plymouth.

Of particular interest is the high degree of automation designed by Webb engineers into the engine block production line. A Webb two-strand indexing type chain conveyor provides positive flow control for engine block production. Also, Webb engineers designed twenty rollover stations where engine blocks are automatically rotated 90° or 180° on the vertical axis to put them into position for the next machining operation. In addition, twenty-two Webb designed turntables index the blocks 90° on the horizontal axis for another machining operation.

Complicated automatic control systems and the control panels were designed and built by Control Engineering Co., a subsidiary of Jervis B. Webb Co. These control panels furnish a visual check on material flow and the operation of the conveyor systems.

This installation is another example of how manufacturers are turning to Webb conveyor engineers for answers to their materials handling problems. Regardless of your needs—single line conveyor or a complete plant conveyor system — Webb engineering service will provide the economical and efficient answer to your materials handling requirements.

Write to us on your company letterhead and we will be happy to place your name on the Webb mailing list to receive factual technical information on conveyor installations, case history reports, and new product literature.

JERVIS B. WEBB CO.

Specialists in Custom Conveyor Systems

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Engineer and Contractor tell in their own words how they rate G.E.'s new motor control center

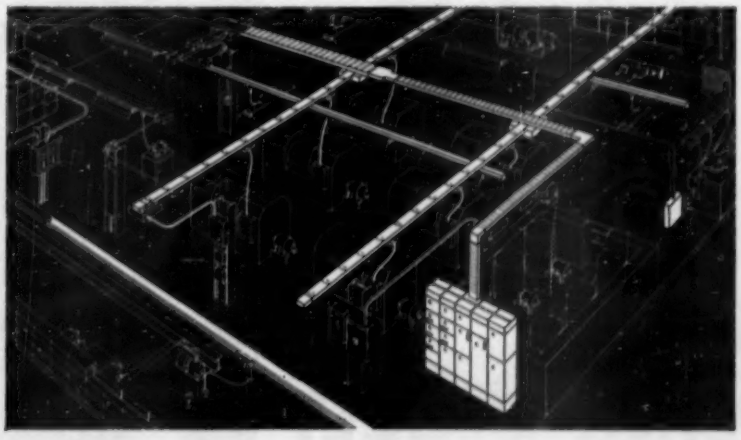
"Nothing in the field could equal this equipment," says plant engineer Henry Roth —"Our job greatly simplified," asserts electrical contractor A. G. Crunkleton.

"At the North American Cement Company," says Henry Roth, "we recently replaced some G-E switchgear after 28 years of continuous operation. Having learned to expect this remarkably dependable kind of service from General Electric equipment, we replaced with G.E.'s Type DA7093 Motor Control Center that you see here. Heavy-duty limestone pulverizing like we are doing here at Hagerstown, (Md.) demands equipment that's durable and easily maintained. We can't tolerate even an hour of lost time in our around-the-clock operation, 365 days a year. That's one reason we chose the DA7093. In addition, this G-E design has built-in flexibility. For example, units can be interchanged to accommodate larger motors, and whole sections can be added to handle increased loads. Our new G-E Motor Control Center gives us the reserve capacity and unusual flexibility we'll need to keep pace with the growing and shifting requirements of our plant."

A system to meet both present and anticipated power loads. "Our job was to design and install a system that could withstand their rugged operating conditions and provide flexibility to meet increased future loads," says A. G. Crunkleton, president of Crunkleton Electric Company, Greencastle, Pa. "The General Electric DA7093 Control Center met those requirements and offers maximum protection to motors and circuits in the event of overloads or shorts. Our job has been greatly simplified and improved because, for one thing, the G-E Control Centers are designed for specific customer demands. The guesswork is eliminated. We work very closely with the G-E people, and they factory-fabricate the equipment to my customers' specifications. When I receive it, it's ready for quick and easy installation."

Shutdowns for maintenance practically eliminated. "Our maintenance electricians," says Mr. Roth, "were particularly impressed. Our inherent dusty working conditions have always led to high maintenance on open-type gear, but this situation has now been entirely eliminated because all working parts of the G-E Control Center are sealed off. After conferences with Crunkleton Electric Co. engineers, we all agreed that the G-E Control Center was the best in our particular situation. Nothing in the field could equal these units for day-in, day-out heavy-duty usage like ours." ***Engineered for maximum safety.*** "The DA7093 has already saved the life of one of our men," says Mr. Roth. Mr. Roth adds, "Since all breakers, relays and starters are within the cabinet, workers can't accidentally get into the wrong circuit. In addition, pilot lights and reset buttons are in open view on each door. And two further advantages are that the padlocked-type handle must be in the 'off' position before the door can be opened, and positive isolation is provided between one section and the others."

The Type DA7093 Motor Control Center (shown in layout) is an integral part of G.E.'s secondary distribution system, which also includes switchboards, busway, unit substations and panelboards. This "system engineered" equipment gives user and contractor seven *work-together* advantages—*1. True extendability* because G-E standardized components are especially designed for easy addition or relocation. *2. Easy-to-assemble. 3. No loss when moving.* "System Engineering" provides for practically 100% re-use of materials. *4. Complete relocation of loads* without rewiring. *5. Maximum electrical efficiency* from components designed to work together. *6. One source of supply* for all components. *7. Skilled planning service* from the G-E Engineer who is selling not just components but "System Engineered" equipment to assure installations with a built-in future. **Distribution Assemblies Department, Plainville, Conn.**



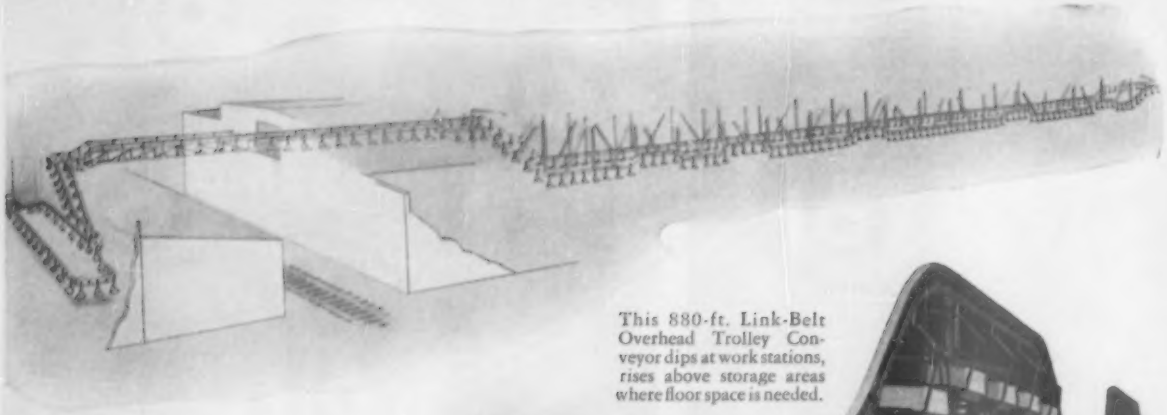
Progress Is Our Most Important Product

GENERAL ELECTRIC

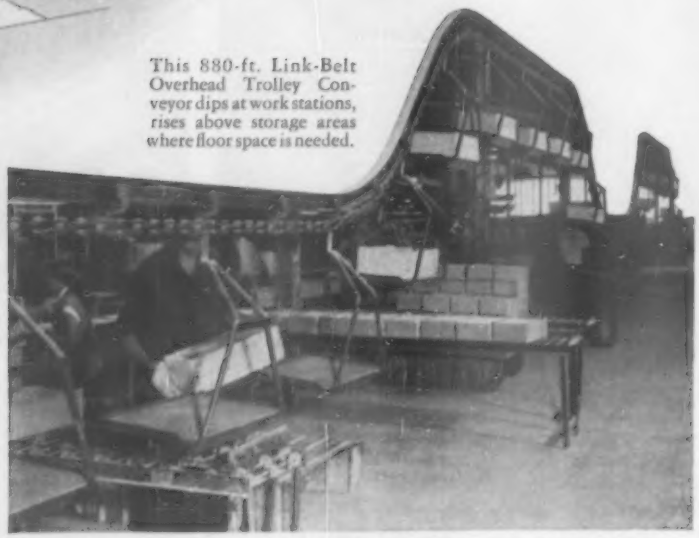
How National Tile & Manufacturing Co.

ACHIEVES 5 MAJOR SAVINGS

with a LINK-BELT Overhead Trolley Conveyor



This 880-ft. Link-Belt Overhead Trolley Conveyor dips at work stations, rises above storage areas where floor space is needed.



At this point, trays are removed and loaded with "green" tiles. Conveyor has improved working conditions by greatly reducing manual handling.

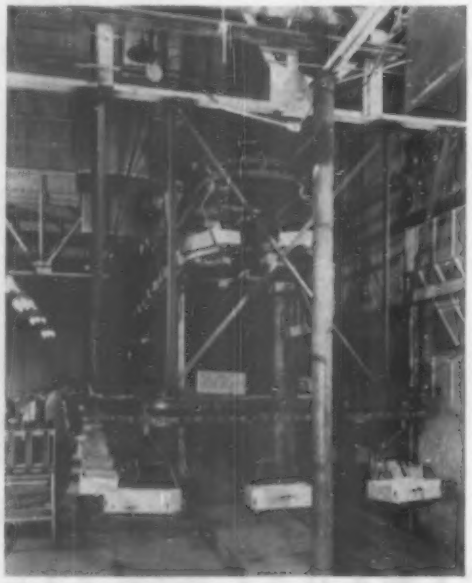
1. **Minimizes product handling**
2. **Reduces product waste**
3. **Cuts container damage**
4. **Handles increased production**
5. **Conserves manpower**

BEFORE 1953, handling methods tried at this Indiana plant had one common drawback. The transporting of tiles from one building to another across railroad tracks always presented a costly handling problem. A Link-Belt Overhead Trolley Conveyor was recognized as the answer . . . and the resulting economies have proved the wisdom of that choice.

Today, tile chipping and breakage have been sharply reduced—damage to tile-carrying trays cut 30%. Costly manpower is free to perform more productive, less fatiguing duties. And a recent 20% production increase required no addition or variation in conveying facilities.

If your plant can profit by continuous straight-line production, call the Link-Belt office near you. With their unmatched background in overhead trolley conveyor applications, our engineers can put your ceilings to work—speed handling from floor to floor or between buildings, if required.

13,587

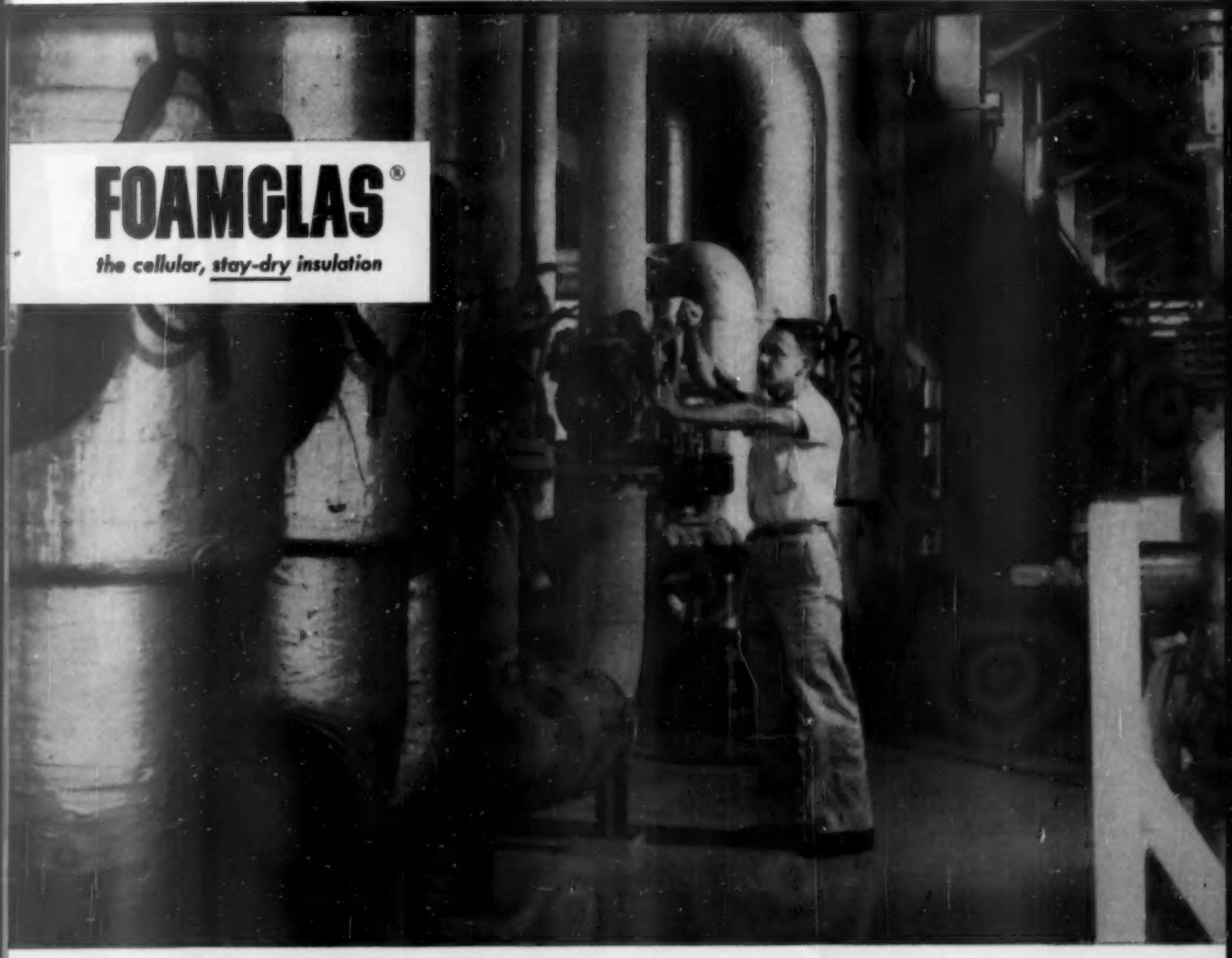


In a series of turns, conveyor drops down to convenient level, permitting tiles to be removed from trays and sorted by color. Heart of the system is Link-Belt ball bearing trolley (below).

LINK-BELT

IN-THE-FLOOR AND OVERHEAD TRUKVEYORS
OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.



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the cellular, stay-dry insulation

Lion Oil Co. maintains peak ammonia production because . . .

FOAMGLAS stays dry for constant insulating protection on refrigerated lines and vessels

Production of anhydrous ammonia at Lion Oil Company's Luling, Louisiana Plant requires extensive use of refrigerated lines and vessels. Precise control of temperatures (down to 12°F.) helps hold compressor suction pressure at 25 p.s.i. for peak production. Effective insulation is a must . . . but the area's prevailing high temperatures and humidities pose some tough insulating problems. FOAMGLAS solved them and gave Lion Oil these important benefits:

- The sealed glass cells of FOAMGLAS are unaffected by high humidity. That means *constant* insulating efficiency for dependable temperature control.
- Effective, *stay-dry* insulation prevents condensation on lines and vessels . . . thus cuts costly corrosion.
- Service to equipment is easily accomplished by cutting through the FOAMGLAS, then replacing only the insulation in the area immediately affected.

Recent inspection by Lion engineers showed FOAMGLAS was fully as effective as when originally applied in 1953. Maintenance has been negligible.

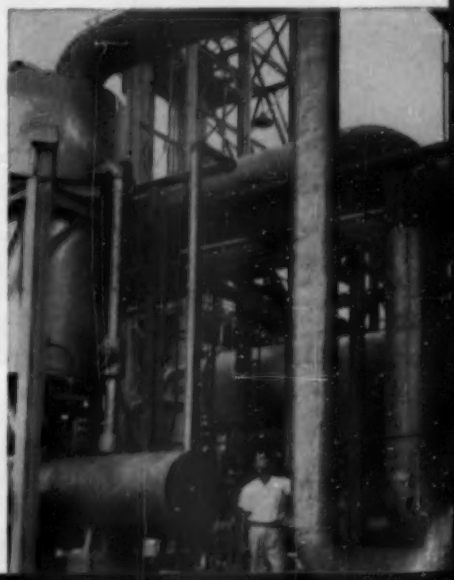
Whether you insulate piping, equipment or buildings, it will pay you to find out more about the *constant, long-lasting* insulating protection of FOAMGLAS. Send today for a sample and literature covering your specific needs.

Pittsburgh Corning Corporation

Dept. M-125, One Gateway Center
Pittsburgh 22, Pennsylvania

In Canada: 57 Bloor St. W., Toronto, Ontario

Light, rigid, easily shaped and fitted with available tools . . . FOAMGLAS can be swiftly and simply applied to piping and equipment of every size and shape. Insulation Contractor: B & B Engineering and Supply Company, Inc., Houston, Texas.



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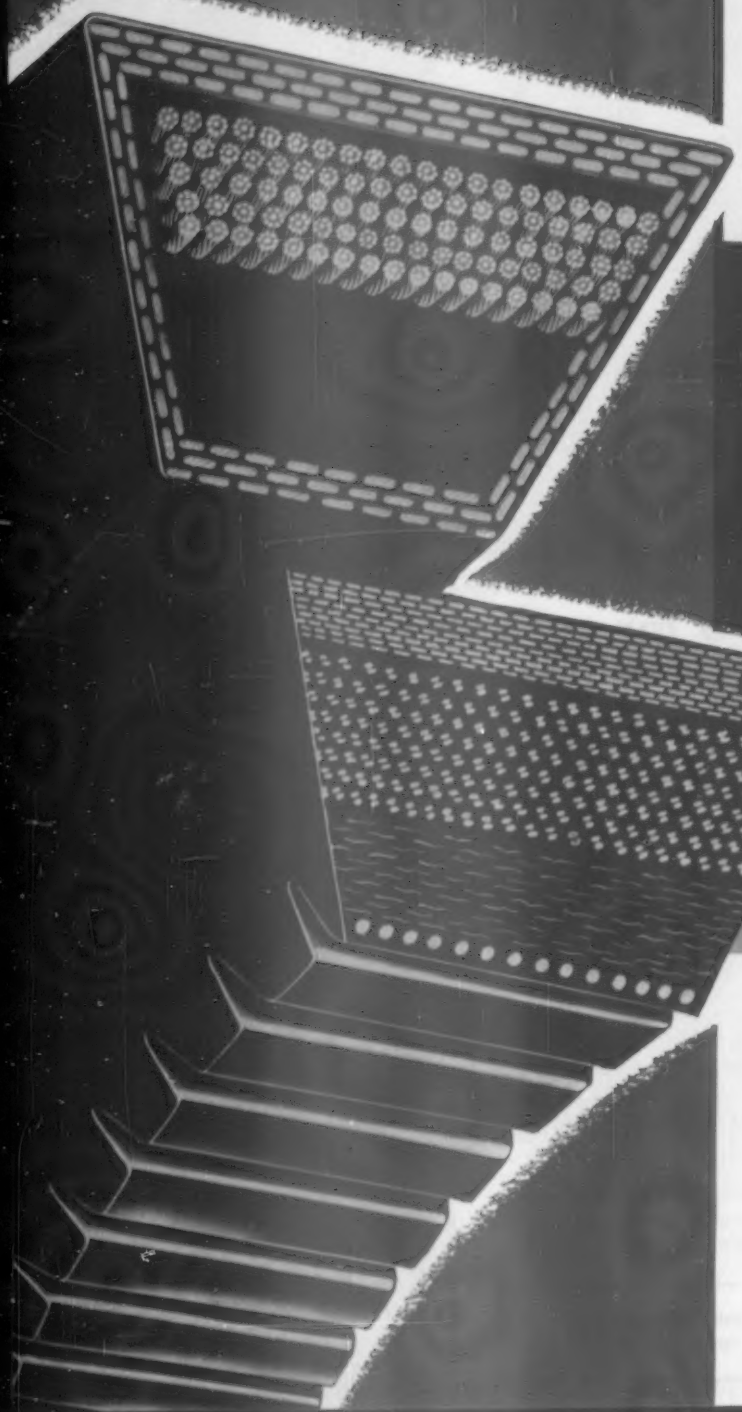


Because Super Thorobreds have controlled elasticity without excessive stretch they reduce belt wear, increase belt life where inherent misalignment or extreme belt twist conditions exist.

BOTH DELIVER 40% MORE HORSEPOWER

THAN STANDARD V-BELTS

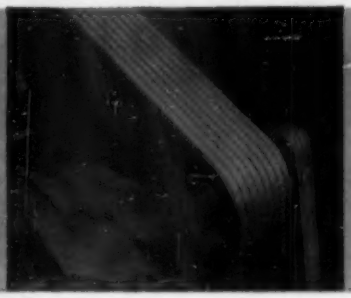
POWERFUL Dayton V-Belts

THAT PROVIDE GREATER POWER CAPACITY AND LONGER BELT LIFE FOR YOUR TOUGHEST POWER TRANSMISSION DRIVES

Super Thorobred . . . an all new Dayton V-Belt. Specifically built for rugged drive requirements . . . where frequent peak or shock loads are encountered . . . where inherent misalignment conditions exist or where oil, heat or static is a drive problem. Because they are built with controlled elasticity without excessive stretch, Super Thorobreds act like a shock absorber . . . reduce belt whipping . . . cushion shock loads. New, stronger, more flexible cover has longer wearing qualities, resists abrasion and cracking. Super strength, synthetic cords provide 40% more H.P. than standard V-Belts. Oil proof, heat resistant, static dissipating Super Thorobreds are available in a complete range of standard sizes. Try Super Thorobreds on your toughest drive. You'll find they're built rugged, dependable and long lasting.

The new improved design Dayton Cog-Belt. The V-Belt that's built to bend. Exclusive Cog construction provides greatest possible flexibility. That means smaller sheave diameters, shorter center distance, less space. And with its 40% bonus horsepower capacity, you can use narrower sheaves . . . fewer grooves . . . fewer belts. Substantial savings in drive weight and cost can be made. And raw edge construction gives maximum coefficient of friction in the sheave grooves. The belt grips tighter, delivers smooth, positive power. Slippage is virtually eliminated, strain on bearings is reduced, fewer take-ups required. Your nearest Dayton distributor will be glad to give you all the facts on the New Super Thorobred V-Belt and improved Cog-Belt. Or write direct to Dayton Rubber Co., Industrial Division, Dayton 1, Ohio.

Belt breakage caused by vibration, pulsation or impulse loads is virtually eliminated with Super Thorobreds due to their ability to check and absorb extreme shock.



Because of their 40% H.P. capacity, Cog-Belts permit drives with narrower sheaves . . . fewer grooves . . . fewer belts. Save 47.2% in drive area . . . 28% of drive weight.

Since Cog-Belts bend easier, smaller sheaves with shorter center distances are permissible. You can actually save 30.6% of the space needed for center distances.

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Dayton Rubber 50 YEARS OF PROGRESS

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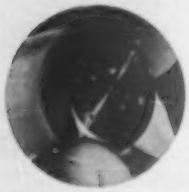
Ask these questions, too, when you judge a fluorescent lamp...

Are its electrodes built for longest lamp life?

Constant development of new and better ways to make fluorescent lamp electrodes has enabled Westinghouse to *triple* the life of its fluorescent lamps since 1948.



Is it easy to seat securely?

Westinghouse fluorescent lamps are built with "guide bumps" on the end-caps. Easily felt with the fingers during lamp installation, they tell at a touch when the lamp has been securely seated in its sockets.

Is it the correct type, size and color for the lighting job to be done?

In the Westinghouse fluorescent family of 290 different lamps—including Slimline and Rapid Start—there's a type and size precisely right for every office, plant and merchandising application. Colors include seven different shades of "white" alone.

For the full story on how to get more for your money in fluorescent light, contact your Westinghouse Lamp Representative or write Westinghouse Lamp Division, Dept. FM, Bloomfield, N.J.

YOU CAN BE SURE...IF IT'S

Westinghouse

FACTORY | EXECUTIVE HEALTH

By REX H. WILSON, M.D., Medical Director
The B. F. Goodrich Company, Akron

...and Don't Catch Cold

The common cold costs industry big money. It's hard to avoid, hard to cure. But here's what you can do.

RUNNY-NOSE SEASON is here again, now that winter's on us. It will bring more absenteeism in your plant. And you'll pay your share of industry's annual bill of over $1.5-billion for sniffles and sneezes, of the thousands of lost man-days charged to the common cold.

The cause of all this trouble? Just one of a number of viruses. So small they can't be seen by the naked eye. So mysterious that nobody knows for sure how they originate, reproduce, live, or affect your body cells. So obscure that specific laboratory tests can be made for only a few. So elusive that procedures that help diagnose virus-caused diseases (cold is only one of a number of these ailments) have to be performed in special laboratories. And so little explored that researchers will continue to discover new types of virus as yet unknown.

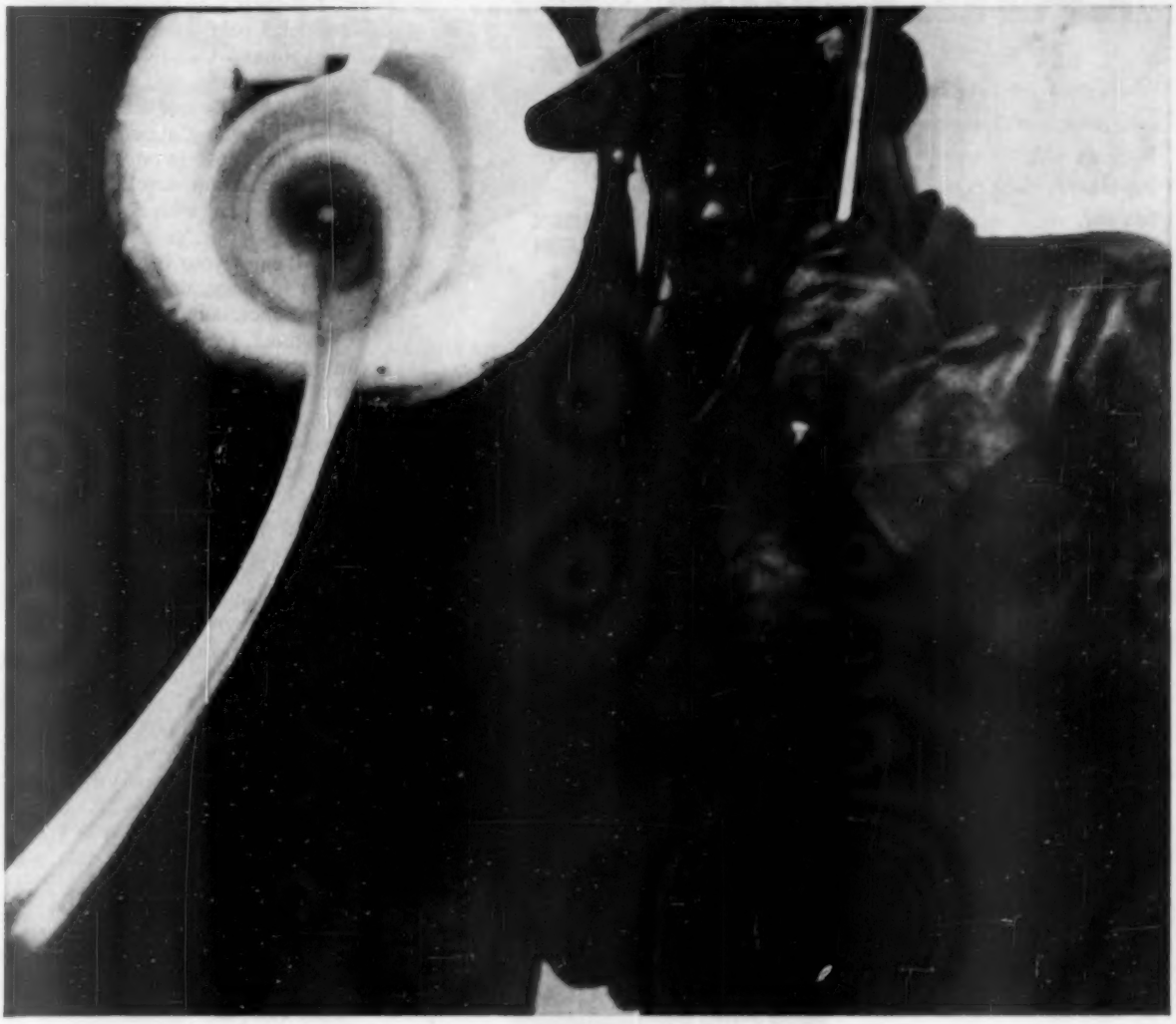
But all the mystery doesn't keep you from knowing when you've got a cold. The general term *cold* is used to cover various acute and chronic infections of the respiratory passages — nose, throat, and lungs. The medical term *coryza* denotes a cold in the head.

Who catches colds?—Just about everybody, though infants and older people seem to have them more often and more severely. Colds can occur anywhere, anytime. Spread rapidly, too — within your own body and to other people. A stuffy nose may be a sinusitis today, a sore throat or bronchitis tomorrow.

Cold virus is usually present in the nasal discharge of persons with a cold for the first three or four days. When sneezed into the air, it remains infective for about five hours. It's readily spread by contaminated hands, drinking glasses, cups, eating utensils.

Colds are more prevalent in winter than in summer. But sleeping on open porches doesn't affect susceptibility. Nor does ventilation — or lack of it. Changes in tempera-

how to judge a fluorescent lamp . . . point no. 3



ask about **TAILORED GLASS**

Quality of glass in a fluorescent lamp directly affects lamp performance. For example: if the "surface condition" of the glass is not exactly right, the lamp's light-producing phosphor coating will not stick securely to the inside of the tube, and bare spots will develop. To make *sure* of proper surface condition—as well as high strength, good clarity, precise dimensions and other essential properties—Westinghouse makes all of its own fluorescent lamp glass, tailoring it from silica to finished tubing specifically for fluorescent service.

YOU CAN BE SURE...IF IT'S Westinghouse

Opportunity for Industry

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Businessmen of Lakeland, Florida will cooperate fully and furnish complete information to manufacturers who will consider relocating or establishing a branch unit in this fast growing central Florida city.

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In the past few years, Florida has become a major consumer and is still growing rapidly. Lakeland is located almost exactly in the center of this new market.

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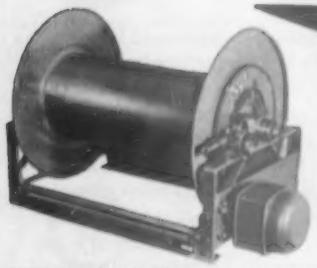

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Begins on page 236

ture do seem to cause a significant increase in colds. And exposure to drafts and chilling often brings one on. Yet there's no explanation why some catch cold, some don't.

Symptoms—Usually mild nasal irritation, sneezing, and tiredness (as if you had to be told). Later, fever, generalized aching, appetite loss, and fatigue may move in on you. Then a burning sensation develops in nose and throat, along with a watery nasal secretion. If you're a smoker you may not enjoy your favorite pastime.

Fact is, diagnosis of the common cold is uncertain until the patient has almost recovered. That's because early symptoms of most virus infections are similar. Characteristic symptoms develop later.

Prevention—The only protection against infection seems to be isolation from people with colds. For instance, it's interesting to note that when healthy isolated communities (like Navy explorers at the North Pole) come in contact with outsiders, an epidemic of colds soon breaks out. But you can't always elude the sneezers.

Anything else you can do? Yes. Some companies offer their employees certain vaccines that tend to increase the body's resistance to cold and influenza viruses. And some install ultraviolet lamps in elevators and toilets to kill viruses. Also, air-conditioned buildings with filtered ultraviolet-treated air might help. But the effectiveness of these measures is uncertain. After all, you have to go home sooner or later.

Fast company—Want to know a little more about viruses? Well, the cold virus runs in pretty fast company. Some viruses (carried by mosquitoes, ticks, flies) cause several types of smallpox and measles. Some cause yellow fever, dengue fever, psittacosis, influenza, poliomyelitis, primary atypical pneumonia, perhaps (as some research suggests) even cancer. Some day research will learn all about viruses and how to cope with them. And all mankind will benefit — healthwise and economically. Until then, just try to do your best with your friendly little cold virus.

Why settle for 50 years when you could have 100?

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Simply whisk off the protective liner from unique "SCOTCH" Brand Double-Coated Tape and you expose a second adhesive surface. Now you've got *two* sides of the strongest adhesive on any pressure-sensitive tape. "SCOTCH" Brand Double-Coated Tapes come in both transparent and opaque types. Ask your "SCOTCH" Brand Tape distributor about "Double-Coateds"; or, write us direct.

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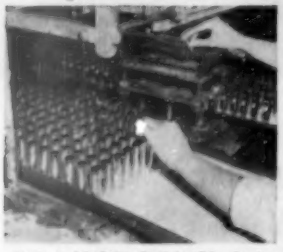

GET A STICKY SURFACE: Strips of "SCOTCH" Brand Double-Coated Tape on bottom of filling-line tray firmly hold freshly painted cosmetic vials; keep them from tipping and smearing.

BOND METAL TO WOOD: "SCOTCH" Double-Coated Tape is used in printing to hold metal engravings to wood or metal bases. Tape holds tight at press speeds; just 25 seconds to mount!

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FREE FOLDER shows many additional ways "SCOTCH" Brand Double-Coated Tapes can save time and money and solve production problems. Write on your letterhead to Dept. CO-125.

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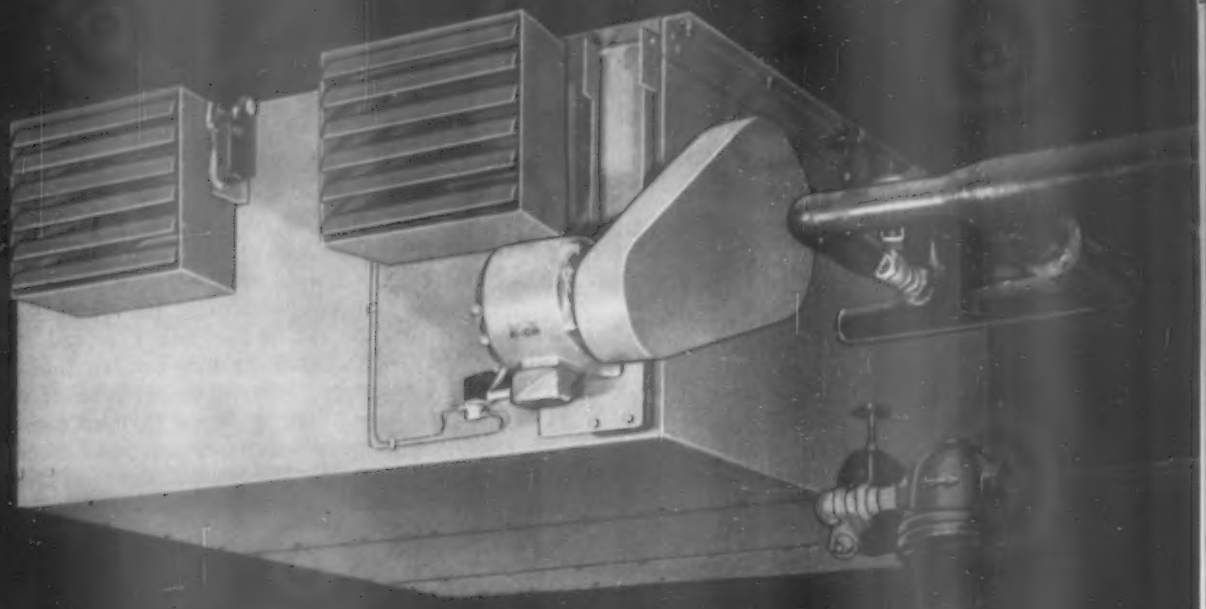
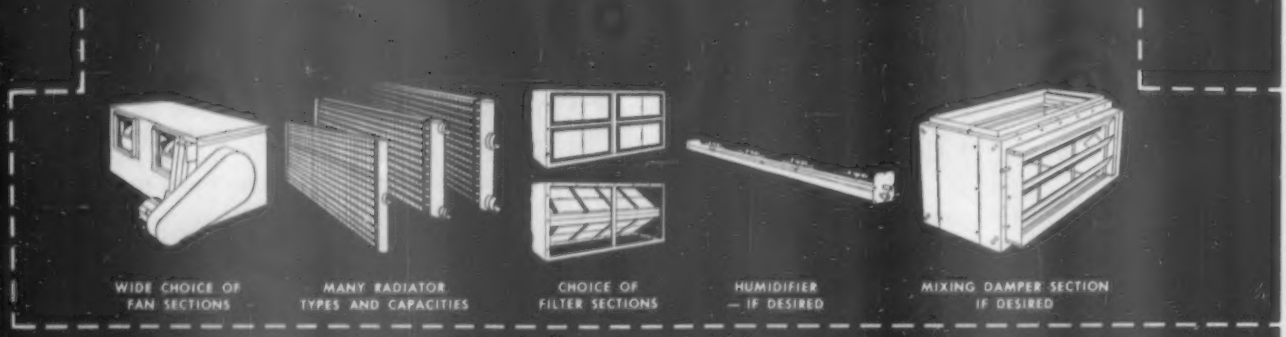
HERMAN NELSON The Industrial Heater designed





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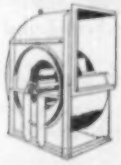
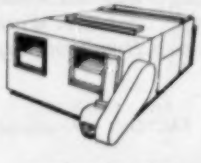


CENTRIFUGAL FANS



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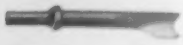

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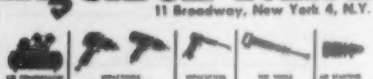


Originators of Impacutools AIR & ELECTRIC

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

18—Roller Conveyor. Fold-out Bulletin GP gives complete description of a general-purpose, pre-engineered line, listing types and sizes available. Illustrations show typical installations and key features. Full page devoted to selection. 6 pages. *Alvey Ferguson Co.*

19—Reach Fork Truck. Bulletin 841 presents a 3000-lb. capacity electric tiering truck, telescopic and non-telescoping models. Describes 11 features and advantages. Lists specifications, showing schematic diagrams. Includes photos of truck in action. *Raymond Corp.*

BUILDINGS

20—Stainless Steel Siding. Mansard pattern sheets for single sheet walls, sandwich walls, and decorative panels are described in Bulletin 70-5. Includes data on insulating value, fastening methods, upgrading old buildings. Also gives detailed specifications. *Joseph T. Ryerson & Son, Inc.*

21—Shatter-Proof Panes. Leaflet gives detailed and fully illustrated instructions for installing translucent flat panes made of polyester resins reinforced with fibrous glass. Specifications and photos of typical installations. Bulletin 532. *Resolite Corp.*

22—Concrete Floors. A seven-step procedure for repairing concrete floors with non-shrink mortar is presented in this data sheet. Description of each step is accompanied by an action photo. Table on compressive strength is included. *Master Builders Co.*

23—Oxychloride Flooring. What it is, where and why it is used is shown in this brochure. It tells how the composition of magnesium oxychloride cement, plus inert fillers and aggregates makes this flooring sanitary, conductive, lightweight, fire-resistant, and strong. *Oxychloride Cement Assn.*

24—Panes and Panels. Two-color folder features flat panes and corrugated translucent fibrous glass panels for varied uses. Construction details for metal-covered buildings and double-pitched skylights. Photos of typical installations. IC-95. *Alsynite Co. of America.*

MATERIALS

25—Vulcanized Fiber. This easy-to-read brochure summarizes how it's made, its outstanding properties, ease of fabrication and forming, shapes and grades available. Includes lists of applications in selected industries. 20 pages. *National Vulcanized Fibre Co.*

26—Ceramics. Five highly corrosion-resistant materials are discussed in Bulletin CHE-R5— porcelain, stoneware, coatings, graphite, "alumina." Offers standard and custom processing equipment made of these materials, showing examples. 16 pages. *General Ceramics Corp.*

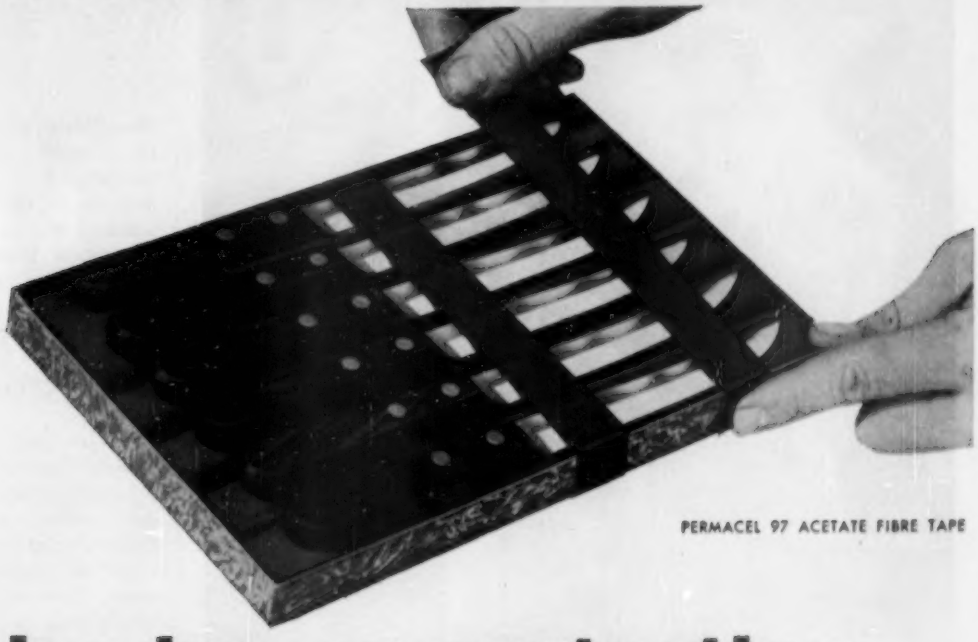
27—Phenolic Molding Compound. Subject of bulletin is "13856 Black," a plastic for products in contact with water. Recommends for agitators, pump housings and impellers, valves, etc. Discusses properties, molding technique, finishing, shelf life. *Durez Plastics Div.*

28—Fluorocarbon Plastics. "Inside U.S.G." is a concise word and picture story of how company functions as supplier of this material for many electronic and chemical-resistant purposes. Describes facilities available to customer. 20 pages. *United States Gasket Co.*

29—Rings and Flanges. Slim-Jim Bulletin No. 10,000 tells how these forged weldless steel units improve your product and cut costs. Traces steps in their manufacture. Discusses application in processing equipment and machinery. 12 pages. *Standard Steel Works Div., Baldwin-Lima Hamilton Corp.*

Turn the page

Whatever the job...



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packaging or protecting

PERMACEL 64 CLOTH TAPE

SELF-STICKING

PERMACEL® TAPES

In our complete line, there's a self-sticking tape for every job . . . write Permacel Tape Corporation, New Brunswick, N. J.

a Johnson & Johnson company

STANLEY *Magic Door* CONTROLS

Present Many Opportunities to REDUCE Costs

Doors that are opened and closed *automatically* by Stanley Magic Door Controls save man hours and traffic flows more smoothly and faster. They save wear and tear on plant mobile equipment as well as on the doors themselves. Heat and humidity losses are minimized. Employees are happier and more efficient . . . and every plant finds plus benefits from every different application on new or existing doors.

Let a Stanley representative share with you his knowledge, gained by over 20 year's experience, to help you reduce costs.

Magic Door Controls with pull cord, regular Stanley operator for "in" and "out" door handling 2-way traffic, using existing air supply on existing doors can be purchased for less than $500. Send for further information today.

STANLEY *Magic Door* CONTROLS

REPRESENTATIVES IN PRINCIPAL CITIES

The Stanley Works, MAGIC DOOR DIVISION
34D-M Lake St., New Britain, Conn.

Gentlemen: ( ) Please send full information on Stanley Magic Door Controls.

( ) Have representative stop in when in the area.

Company Name_____

My Name_____

Address_____

City_____ Zone_____ State_____

FACTORY / CATALOG NEWS
Begins on page 152

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

30—Plastic Spray. Here's the story on a liquid vinyl material that can be sprayed on building surfaces of any size or shape to form a pliable sheeting of high tensile strength and elongation. Photos show many uses both indoors and outdoors. *Liquid Plastics Corp.*

PRODUCTION

31—Grinding and Lapping Machines. Catalog 1843 contains photos and specifications on many precision grinders — cylindrical; cam, shape, crankpin; tool and cutter; universal; surface; special-purpose units. Lapping machines are also covered. 32 pages. *Norton Co.*

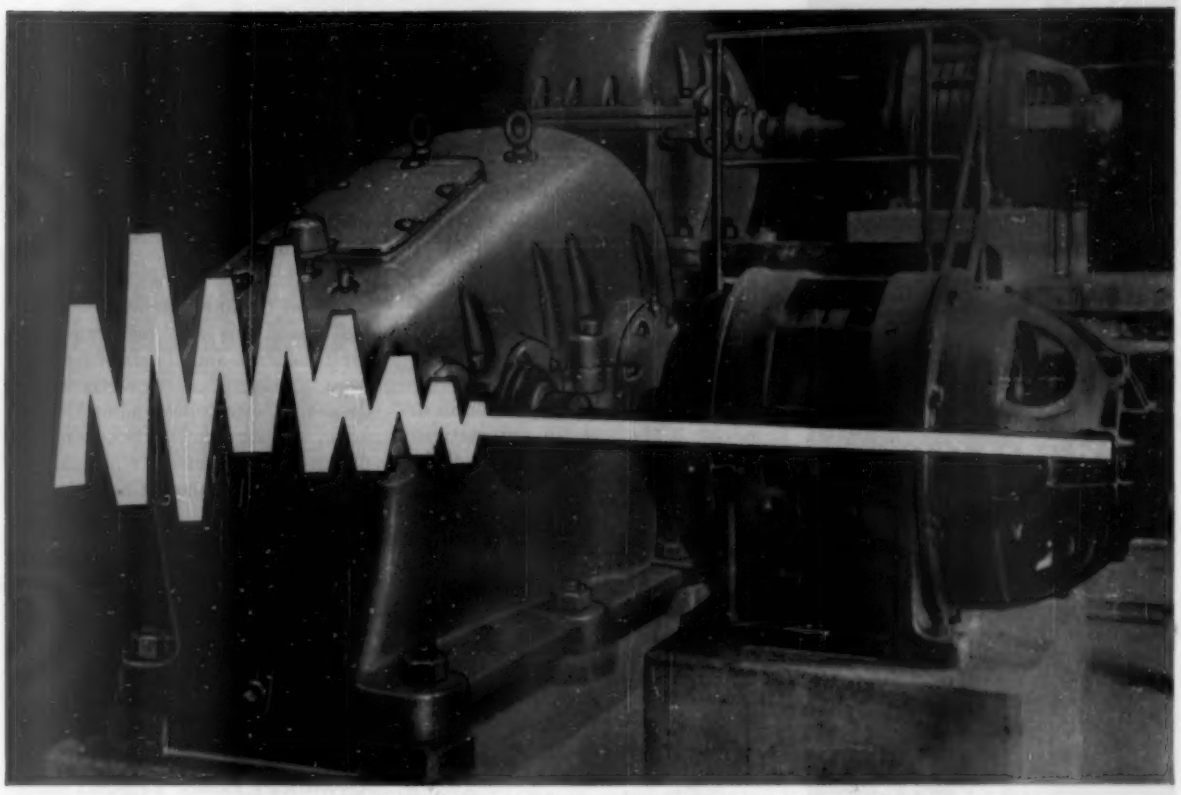
32—Special Machine Tools. 24-pager describes and illustrates 20 automated transfer-type, line-index, trunnion-type, and rotary-index tools for a variety of metalworking operations. Includes glossary of automation words and phrases. *Snyder Tool & Engineering Co.*

33—Process and Transfer Equipment. Informative, two-color booklet uses photos, line drawings, diagrams, and brief text to describe 20 units for many industries. Features 2-page, foldout diagram of use in cylinder block production. 16 pages. *W. F. & John Barnes Co.*

34—Jig Borers. Four models in a wide range of sizes are presented in 28-page Circular No. 587. Includes photos, diagrams, detailed specifications. Applications, features, measuring system are discussed and illustrated. Available accessories listed. *Pratt & Whitney.*

35—Precision Manufacturing. Tabbed sections in this 32-page booklet give picture-caption stories of production processing and service facilities for plate processing, mass production of small precision parts, tool and die production, metals processing, assembly and development. *Hamilton Watch Co.*

Turn the page



Compact, rugged Link-Belt Parallel Shaft Drive "shrugs off" shock loads. Available with ratios up to 300:1 and horsepower capacities to over 2000.

Rugged LINK-BELT Parallel Shaft Drives

"shrug off" shock loads

WHEN it comes to judging a drive's resistance to shock and frequent overloading, ratings tell only half the story. It's these construction refinements of Link-Belt Parallel Shaft Drives that give you further assurance of long-range speed reduction economy:

GEARS are precision machined, shafts rigidly supported.

BALL AND ROLLER BEARINGS are used throughout.

GREASE-LUBRICATED SEALS block shaft openings to dirt.

AUTOMATIC SPLASH LUBRICATION cuts maintenance.

You'll find, too, that Link-Belt has simplified inspection and maintenance by making all parts accessible without disturbing the base. And to prevent reverse rotation on conveyors, elevators and similar equipment, a built-in backstop can be provided.

There are many more facts worth knowing—as well as specifications and application data — in Book 2619, available from your Link-Belt office or authorized stock-carrying distributor. Or write direct.

Get JOB-MATED drive combinations from the complete Link-Belt line

In addition to parallel shaft gear drives, Link-Belt builds in-line helical and worm gear drives, Gearmotors, Motogears, variable speed drives, fluid drives, chains, sprockets, couplings, bearings, etc. All are pre-engineered for easy installation and maximum efficiency.

LINK-BELT

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LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

There's 60 years of experience packed in every can . . .

Call the GARLAND MAN for experienced advice on industrial maintenance paints, roof or floor repairs. Garland's been solving paint, roof and floor problems since 1895.

Send us your special problem

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GARLAND
COMPANY
Cleveland 5, Ohio

FACTORY / CATALOG NEWS . . . *Begins on page 152*

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

36—Centerless Grinders. Two sizes are covered in 26-page Catalog T-55. Contains specifications and information on extra equipment, including 56 photos and sketches. Illustrates a variety of applications and automation ideas. Lists features. *Landis Tool Co.*

37—Transfer Machine. Bulletin describes a machine for automatically moving large sheet metal panels between presses. Transfer and turnover operation is explained with schematics. Use on a fender skirt and a roof press line is illustrated. *Sahlin Engineering Co.*

38—Punch Presses. Case history catalog illustrates applications of open throat machines in 34 different plants. Photos of such operations as automatic feeding through 10-stage progressive die, flash trimming, punching holes; and many others. *Diamond Machine Tool Co.*

39—Presses. Bulletin 65C presents a line of gap frame double crank machines consisting of an upright series and open back inclinable series. Descriptions and close-up photos of many features. Specifications; selection hints. 26 pages. *Niagara Machine & Tool Works.*

40—Drill Press. Handy folder lists several typical uses for "Portomag," a portable, magnetic tool. Explains how drill may be taken to the work, rather than work to the drill. Dimensions, specifications, and weights of 11 standard models are listed. *Portomag Sales, Inc.*

41—Transfer Machine. If your product is subject to design changes that necessitate retooling, you'll be interested in this folder on "Transo-Mator." Tells how roller gear drive for high-speed precision indexing automates many operations. *Ferguson Machine & Tool Co.*

42—Multiple-Way Machine Tools. Brochure illustrates 1-, 2-, 3-, 4-, 5-way, and center column machines for drilling, reaming, tapping, facing, milling. Includes tooling drawings. Estimated production figures based on 100% efficiency. 8 pages. *W. F. & John Barnes Co.*

43—Gas Cutting Machine. A multiple torch unit and its accessories are described and illustrated in 12-page, 2-color Catalog 804B. Gives details on electronic, manual, magnetic, spindle tracers. Schematic of dimensions and operating limits. *Air Reduction Sales Co.*

44—Gear Machines. Representative models in a line of gear shaving machines, gear inspection equipment, gear lapping and grinding machines, self-contained broaching fixtures and broaches are presented in Catalog AP55-8. 16 pages. *National Broach & Machine Co.*

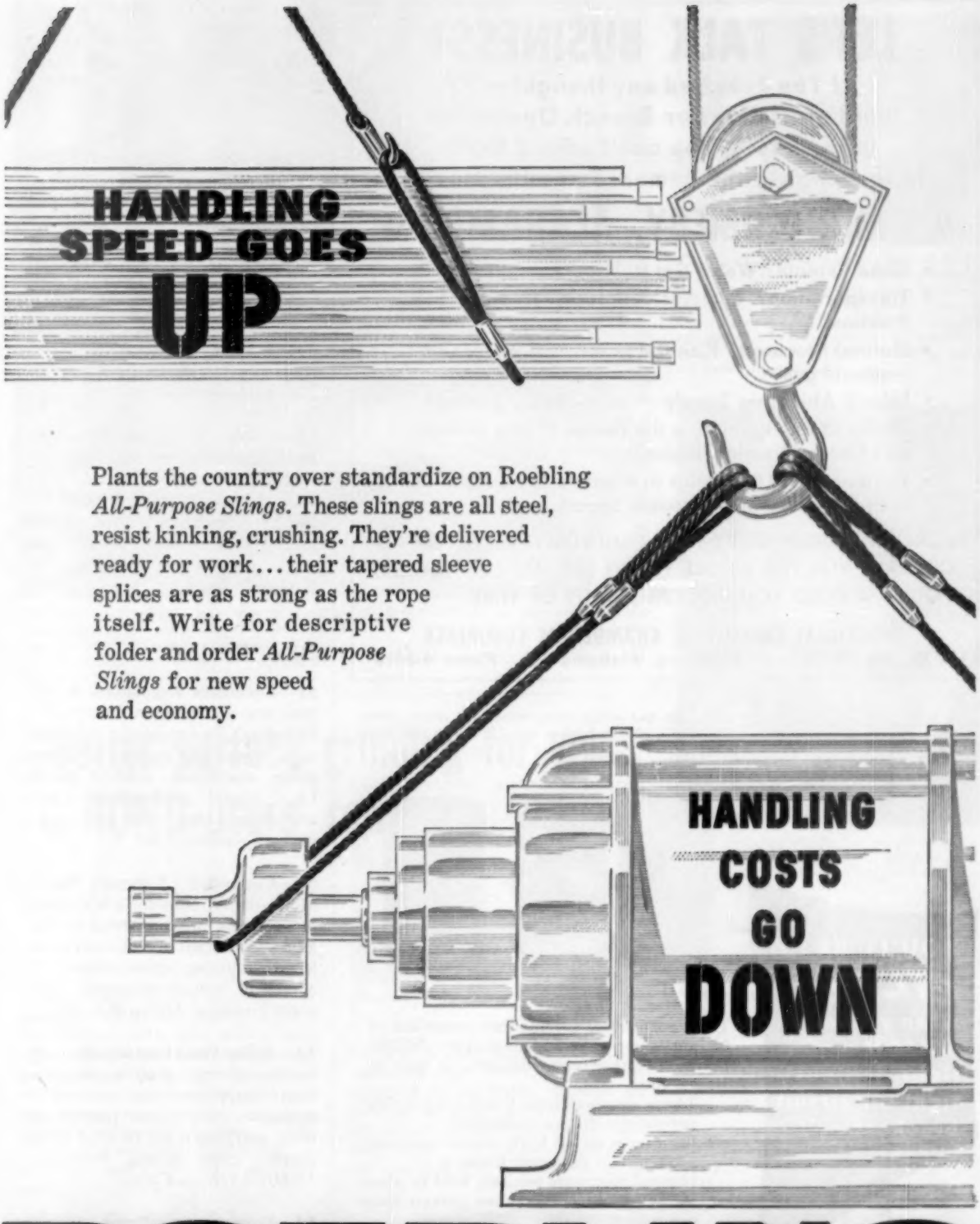
45—Rotary Tables. Two data sheets on two types: a 42-in. plain table with automatic indexing and a 24-in. plain table with a projection optical measuring system. They explain how tables operate; note features. Detailed specs. Circulars 593, 594. *Pratt & Whitney.*

46—Broaching Machine. Details and features of continuous unit with effective stroke length of 154 in. (height is 138 in.) are covered in Bulletin VCA-55. Includes information on construction, operation, controls, and specifications. *Colonial Broach & Machine Co.*

47—Grinder. Combination way-and-surface machine is featured in 8-page folder. Explains how it grinds "V" and flat ways, dovetails, shoulders, edges, other contours in one set-up; holds two or more surfaces in exact, relative alignment. *Mattison Machine Works.*

PIPELINES & FITTINGS

48—Aluminum Pipe and Fittings. Products for conveying everything from air to acid are described in this 18-page booklet. Characteristics and advantages for each major field



Plants the country over standardize on Roebling *All-Purpose Slings*. These slings are all steel, resist kinking, crushing. They're delivered ready for work... their tapered sleeve splices are as strong as the rope itself. Write for descriptive folder and order *All-Purpose Slings* for new speed and economy.

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LET'S TALK BUSINESS!

If You Ever had any thought of locating a Plant or Branch Operation in the South, You can't afford NOT to investigate the immense possibilities of

★ MONTGOMERY, ALABAMA ★

- **Good Climate? We've Got It, Year 'Round!**
- **Transportation? 6 major railroads, 35 truck lines, 2 airlines**
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- **Markets? Montgomery is the Center of One of America's Fastest Growing Regions**
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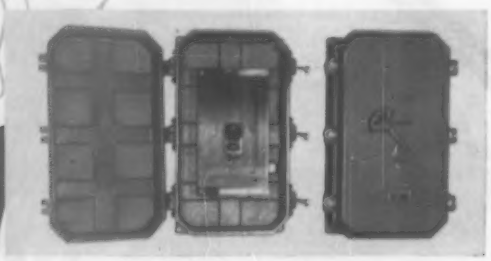
SORRY OUR BRIEF STORY MUST END! YOU'LL HAVE TO CALL OR WRITE FOR THE WHOLE STORY! BUT, BELIEVE YOU US, YOU'LL BE GLAD YOU DID! CALL, WRITE OR WIRE

INDUSTRIAL COMMITTEE, CHAMBER OF COMMERCE
P. O. Box 79 Montgomery, Alabama Phone 4-8416

Inside and outside views: Nelson 225 ampere frame, 3-pole, 600-volt breaker with 125-ampere trip rating.



YOU'LL BE *GLAD* when you install NELSON water-tight and dust-tight air circuit breakers . . .

The dependable, trouble-free operation of Nelson water-tight and dust-tight (NEMA IV & V) air circuit breakers, is sure to please you.

1) These thermal-type breakers provide *dependable* circuit protection.
2) Enclosures are of high tensile cast iron, produced in our own foundry.
3) Hinged covers are securely held in place by swing bolts. Neoprene gaskets keep out water and dust.
4) Breakers can be furnished in ratings up to and including 600 amperes, 600 volts.

• Write for Bulletin No. 1012.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

of application are presented. Fittings and installation data. *Aluminum Co. of America.*

49—Hydraulic Valves. High-pressure, three-way units are subject of this 8-page booklet. Double page on application hints includes sketches of examples. Cross-section has numbered parts for easy reference to ordering chart. Form V-1 847. *Seely Instrument Co.*

50—Valves. Three bulletins cover three types: manual and foot-operated air valves, 0-4000 psi. (A-5); manual water valves, 0-6000 psi. (W-5); manual oil valves, 0-6000 psi. (0-5). Characteristics, flow patterns, dimensions, ordering data. *Barksdale Valves.*

PROCESSING

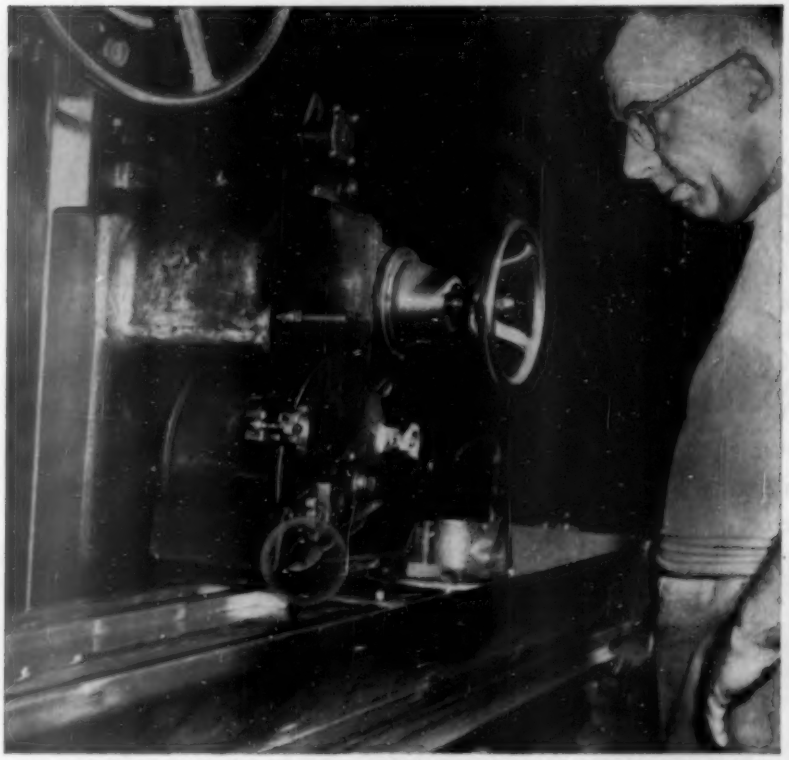
51—Pneumatic Regulators. A complete line is covered in Bulletin H-2, including filter-regulator combinations, filters and regulators, relays, purge assemblies, control panels. Lists typical applications. Cross-sections and dimension drawings. 8 pages. *Conoflow Corp.*

52—Controlled Volume Pumps. Motor-driven units for low-capacity flow control are presented in Bulletin 955. Details operation of stroke length adjusting servo system. Diagram of typical pneumatic flow-control system. *Milton Roy Co.*

53—Boiler Plant Instruments. Combustion guides; draft gages; flow, level, temperature, and pressure instruments; combustion control systems; and panels are covered in this 24-page color catalog. Publication 55-605-83. *Hays Corp.*

54—Proportioning Pump. Bulletin 1105-2 lists many advantages of the "Adjust-O-Feeder," for pumping petroleum, chemical and boiler feed water additives in accurate predetermined quantities. Schematic diagrams. *Proportioneers, Inc.*

Turn the page



"Competitive wheels have never equalled G Bond wheels on our jobs." This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, extremely free cutting, requiring little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001".

Grinding precision spur gears of SAE 8620 steel, hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.

Jigs, fixtures and other parts of miscellaneous steels, besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.

Better surface grinding for you... G BOND users' reports prove it!

Top speed, new economy among many "TOUCH of GOLD" advantages listed

Reports from surface grinding customers on the performance of G Bond wheels sound pretty much alike. That's logical, because each customer is getting exactly the advantages he's looking for — *freer, cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.*

Your Own Surface Grinding

will benefit by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage that means time and money saved, plus better product quality, throughout the range of precision and semi-precision grinding jobs.

See Your Norton Distributor

for the G Bond wheels, cylinders and segments you need. They're available in a variety of famous Norton abrasives. Of these, 32 ALUNDUM* abrasive is particularly suited for fast stock removal and heavy feeds — it grinds exceptionally cool and fast, with minimum dressing.

And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Making better products... to make your products better

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W-1646

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TRADE ARRO MARK
This Trademark shows that you have the finest in drilling and anchoring devices when you use ARRO.
Always Specify ARRO
ARROFLUTE CARBIDE MASONRY DRILL
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FOUR-POINT DRILL POINT
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See your industrial, hardware or electrical supplier
ARRO EXPANSION BOLT COMPANY
1420 Boone Ave., Marion, Ohio

Begins on page 152

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ELECTRICAL

55—Saturable Reactors. Bulletin describes theory and application as control equipment for individual power loads. Discusses control of electrically heated equipment, automatic temperature stabilization, reduced-voltage motor starting; others. *General Electric Co.*

56—Portable Tool Electrification. Bulletin 51 details advantages of a safe enclosed trolley busway system. Tells what it is, what it does. Pictures application in production, assembly, and test lines. Shows cutaway view of trolley outlet. *Feedrail Corp.*

57—Raceways and Fittings. 132-page catalog and wiring guide shows a complete line of surface metal units. Detailed installation instructions for all sizes, including "plug-mold" multi-outlet assemblies. Fluorescent and slimline equipment also presented. *Wiremold Co.*

58—Limit Switches. Lever and rotating cam types are the subject of Bulletin GEA-6131A. Applications listed include control of machinery travel, machine tool valves, automatic conveyors and balers; many others. Ratings, dimensions. 8 pages. *General Electric Co.*

INSTRUMENTS & CONTROLS

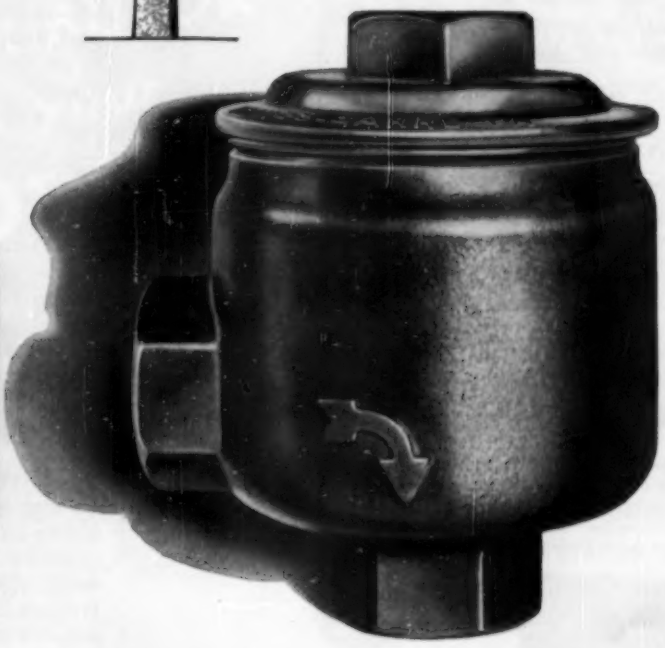
59—Gamma Ray Projectors. Three portable models are presented in this 24-page booklet: for pipe and field work; for pressure vessels, tanks, and large pipe; for larger vessels and non-destructive testing. Discusses general aspects of radioactivity. *Metal & Thermit Corp.*

60—Photoelectric Systems. Booklet on use of electronic equipment is in non-technical language. Includes units for wide-area supervision, combustion supervision; relays; illumination control; fan motor stop;

TALK ABOUT

Capacity

Discharge orifice of 1" NICHOLSON trap (A) compared with other types of same size (B). Nicholson's greater—in every size!



Compare capacity of a Nicholson Steam Trap with any other trap of same size. Greater capacity—right across the board—means Nicholson Industrial Traps discharge condensate and air from steam lines and process equipment *faster*, more *effectively*. In toughest plant service, Nicholson's pay off 4 ways:

- **lower initial cost—more for the money**
- **less upkeep expense—minor maintenance**
- **faster warmup—high, even temperatures**
- **faster production—increased 20% to 30%**

Where performance counts, specify Nicholson. Write for *Catalog 953*.

NICHOLSON

W. H. NICHOLSON and Company

TRAPS • VALVES • FLOATS • METAL PARTITIONS

14 OREGON STREET, WILKES-BARRE, PA. • SALES AND ENGINEERING OFFICES IN 58 PRINCIPAL CITIES

An offset eye may mean nothing to you, but an offset motor could cut floor maintenance costs for you.

The exclusive Kent floor machine design cuts labor costs up to 18.9% over center-mounted and divided-weight machines.

KENT EXCLUSIVE FEATURES:

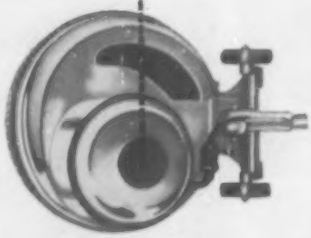
Balanced Power . . . minimizes torque, offsets handle weight

Floating Power . . . "cushioned" gears

"Power" Steering . . . fingertip control

Only 2 Gears

Fully Enclosed Motor . . . no dust, no dampness



Offset motor means Balanced Power

Imperfect balance and torque—sidewise pull of the brush—make ordinary floor machines hard to operate. Kent's exclusive offset motor counterbalances handle weight and minimizes torque . . . means less fatigue, faster work. All weight is evenly distributed on the revolving brush—longer wear, fewer service problems.

Kent's famous cleaning team uses a Kent industrial vacuum cleaner—for wet or dry pickup.

Cuts costs 18.9% more than competitive Floor Machines.

MAIL COUPON TODAY!

KENT Company, Inc.
456 Canal Street, Rome, New York

Yes, I want to cut maintenance costs! Send full details on your line of floor machines vacuums.

Name .....

Address .....

City ..... State .....

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burglar alarms; communicating systems; receptionist. 20 pages. *Worner Electronic Devices.*

61—Meters. Bulletin OG-409 shows bronze "Rotocycles" for in-plant process metering, for liquid inventory, for tank truck dispensing. Recommends for alcohols, brine, water, ketones, organic ester, mild acids, beverages, sugars, syrups. 8 pages. *Rockwell Mfg. Co.*

62—Instruments and Control Systems. Bulletin GSP-901 covers ring balance instruments, components for control systems, electronic devices, force measuring devices, viscometer, water and steam treatment test equipment; plus chemical products. 24 pages. *Hagan Corp.*

63—Electro-Pneumatic Control. A current-adjusting unit for processing is subject of 8-page Folder ND4(8). Photos and line drawings illustrate system, details of control unit and converter. Describes proportional, automatic rest, rate actions. *Leeds & Northrup Co.*

64—Electronic Test Equipment. Catalog R36A illustrates and describes a complete line, including instruments for servicing TV, radio, other communications equipment. Presents simplified method for servicing TV receivers. 16 pages. *Weston Electrical Instrument Corp.*

65—Gages. A broad variety of standard and special gages and measurement control methods are described in this 8-page brochure. Gives photos of special and built-up gages, special air gage fixtures, unusual air gage applications for metalworking. *Freeland Gauge Co.*

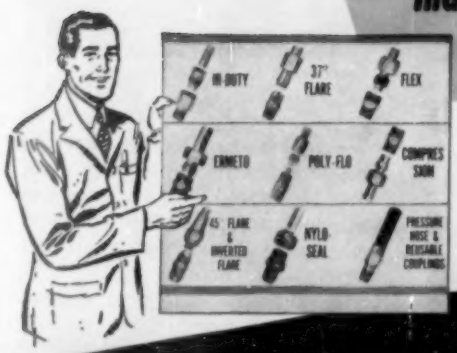
66—Transformer Systems. Measurement and control systems utilizing linear variable differential transformers are featured in 6-page fold-out. Includes transducers, displacement indicators, amplifiers for oscillographic studies, displacement controllers. *Daytronic Corp.*

Turn the page

YOUR IMPERIAL DISTRIBUTOR OFFERS

Industry's Most Complete Line of Tube Fittings

SHORT CUT NO. 1



Whatever your tubing connection needs, your Imperial Distributor can help you because he carries industry's most complete line. He handles fittings in brass — steel — aluminum — stainless steel — nylon. For low — medium — high pressures.

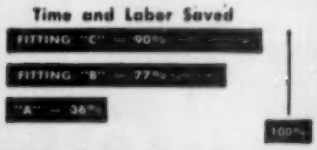
Your IMPERIAL DISTRIBUTOR is your SHORT CUT TO BETTER TUBING CONNECTION SERVICE

YOUR IMPERIAL DISTRIBUTOR OFFERS

Time and Money Saving Suggestions

SHORT CUT NO. 2

Because your Imperial Distributor carries industry's most complete line of tube fittings, he can make impartial recommendations on the *best* fitting for every job. Often he can suggest fittings that will not only give top performance, but will cut man-hours of installation time by substantial percentages as shown in this chart.



YOUR IMPERIAL DISTRIBUTOR OFFERS

Big Local Stocks for Quick Delivery

SHORT CUT NO. 3

Your Industrial Distributor carries large stocks of fittings on hand in a wide range of types, styles and sizes ready to meet your needs quickly. Also a wide range of shut-off valves.

YOUR IMPERIAL DISTRIBUTOR OFFERS

A Complete Line of Tubing Tools

SHORT CUT NO. 4

Industry's only complete line of tubing tools for Cutting, Flaring, Bending, Reaming and Swaging all types of tubing is available from your Imperial Distributor. These tools help to make better joints that STAY LEAKPROOF.

Ask for Bulletin No. 3039 which outlines a practical program for getting tubing jobs done faster, better, more economically.

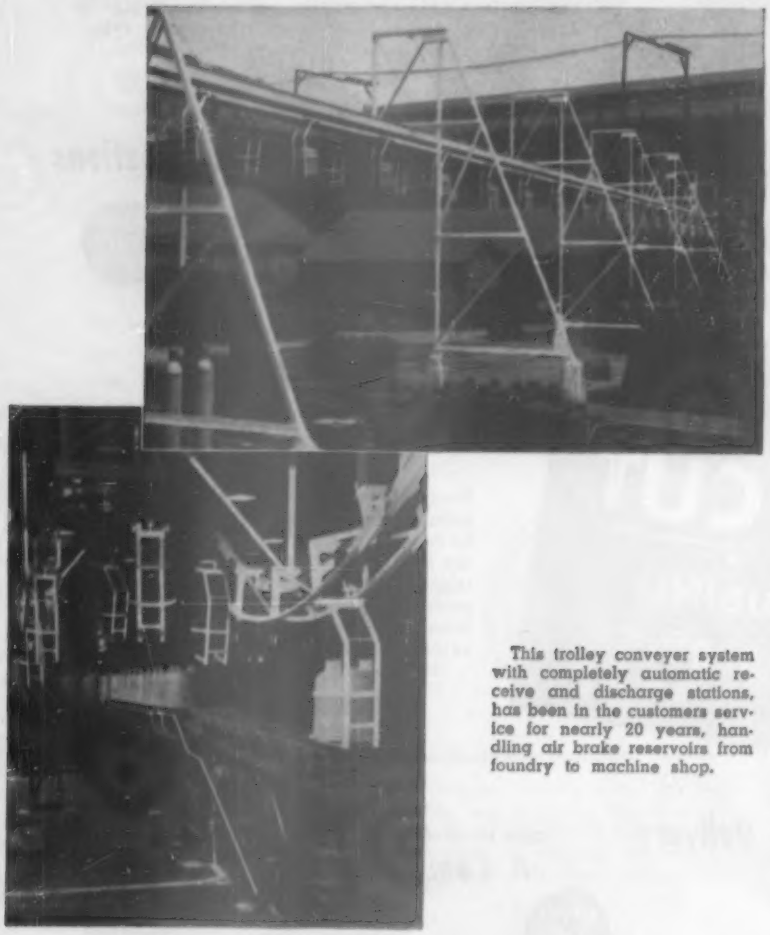
IMPERIAL

THE IMPERIAL BRASS MFG. CO., 517 S. Racine Ave., Chicago 7, Ill.
In Canada: 334 Lauder Ave., Toronto, Ontario

Industry's Most Complete Line of Tube Fittings and Tubing Tools

50th Anniversary IMPERIAL 1905 1955

Automation...
A New Word for an Old Idea



This trolley conveyer system with completely automatic receive and discharge stations, has been in the customers service for nearly 20 years, handling air brake reservoirs from foundry to machine shop.

The Engineers in the Conveyer Industry have been working at **Continuous Flow Material Handling** for a long time. The first Mathews equipment, for example, was built over 50 years ago, and although comparatively simple, was applied to do exactly what is expected of today's highly special conveying machinery — to help manufacturers produce more, at less cost.

Call it Automation, Continuous Flow, Technocracy — call it what you will. The results are the same—**more good things for a greater number of people.**

Whatever your product—whether you measure its weight in pounds or tons—if it must be handled, there are Mathews Conveyers to do the job efficiently.

50 YEARS OF MC MECHANIZED HANDLING

MATHEWS CONVEYER COMPANY
GENERAL OFFICES . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV., MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . . MATHEWS CONVEYER COMPANY, LTD. PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities
Export Representative—Foreign Trade Division of New York Hanseatic Corporation

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

67—Analog - to - Digital Converter. Brochure describes a unit that combines high speed with accuracy and sensitivity; accepts signals from several sources, converts to any code. Shows block diagram of the converter, diagram of typical system. 8 pages. *J. B. Rea Co.*

68—Numerical Control. Here's the story of an automatic method of translating blueprint data to machine operations without the aid of an operator. Folder lists seven advantages of this system. Gives details on a jig borer application. Circular 591. *Pratt & Whitney.*

69—Dial Gages and Setmasters. Brochure gives details on snap, bore, large diameter, length gages, and their companion setmasters, including adjustable types. Features ruled sketch sheets to make it easy for you to present your gaging problems to maker. *Boice Mfg. Co.*

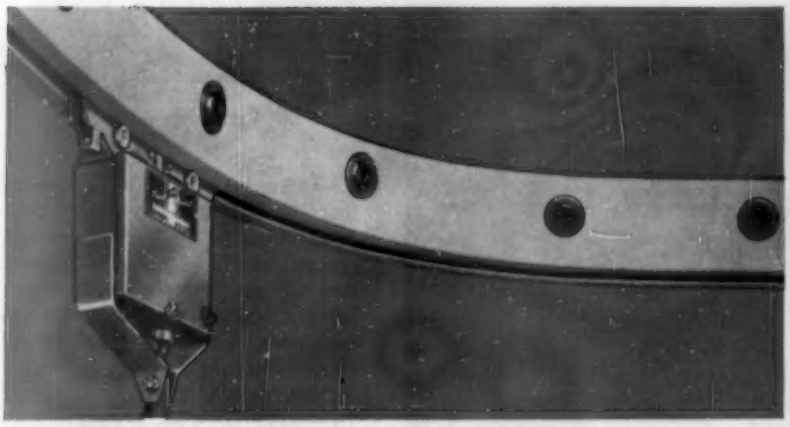
70—Gages. Two booklets on two types—multi-dimension gaging machines for in-process gaging and final inspection, and the "Air-O-Limit" comparator — a pneumatic gaging method. Applications are discussed. 12 and 24 pages. Circulars 592 and 586. *Pratt & Whitney.*

MISCELLANEOUS

71—Snow Plows. Folder shows how these rotary units attach to front-end tractor loader with same pins and connections for bucket. Shows how they mount on crawler tractors, motor graders, jeep trucks. Three models illustrated. Form RE-132. *Wm. Bros Boiler & Mfg. Co.*

72—Fans. Two bulletins cover light and heavy-duty models. Tables of performance data list electrical power requirements, delivery ratings at different static pressures, quietness ratings, motor horsepower, other information. Installation drawings included. Bulletins 6514, 7214. *American Blower Corp.*

Turn the page



POWER ON WHEELS! Smooth-rolling trolleys tap power from Industrial Trol-E-Duct, feed it to portable tools, cranes, hoists and other moving "loads." Curved sections allow duct to fit any assembly line layout. Duct is easy to install—rated at 100 and 225 amps to fit all mobile-tool needs.

ADD, REMOVE, RELOCATE trolleys in minutes. No downtime. No rewiring. Trolleys also serve as hangers for light power tools.

BULLDOG INDUSTRIAL TROL-E-DUCT

Rolls the Power to the Job...

AND WHEN POWER ROLLS, PRODUCTION DOES, TOO!

Power that moves *freely* with the job. That's the key to greater production—the reason you should look closely at BullDog Industrial Trol-E-Duct®.

Visualize it in your plant. Mobile trolleys, feeding portable tools and other "loads", ride overhead, just a gentle tug away from the work bench or assembly line. An outlet is always at hand right *when* it's needed. And you can add *new* outlets by adding extra trolleys. No wasted time; no dangerous open wiring; no long, hazardous extension cords. You save *daily* by eliminating downtime and maintenance. You get a modern, flexible system that pays off in increased production.

Get the complete story on Industrial Trol-E-Duct from your BullDog Field Engineer or Qualified Distributor, or write: BullDog Electric Products Company, Detroit 32, Michigan.

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IF IT'S NEW
... IF IT'S DIFFERENT
... IF IT'S BETTER ... IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. ***In Canada:*** BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.

PRICED TO SAVE YOU MONEY... BUILT TO CUT YOUR COSTS!

Series "D" All-Electric 'Load Lifter' Cranes are standardized and mass produced to meet average industrial needs. They cost far less than other cranes built for the same service. Extra value is engineered in—all have features first performance-proved on heavy-duty "Shaw-Box" Cranes.

Series "D" 'Load Lifter' Crane capacities range from 1 to 20 tons. Every size has rugged, rigid *three-girder* bridge construction—no whipping or skewing! All gearing operates in oil in sealed housings. All moving parts rotate smoothly on antifriction bearings. Motor and shaft are permanently aligned. Maintenance requirements are minor. Dependable safety devices protect man, load and crane.

Accurate spotting is easy with a Series "D" 'Load Lifter'. Cranes have fast-acting brakes and variable speed magnetic control. They are operated by push buttons on floor controlled cranes and by master switches on cage controlled cranes. Get complete size, type, trolley style, span and other data. Write for Catalog 221, then select and order a money-saving Series "D" 'Load Lifter' Crane.

'Load Lifter' CRANES

MANNING, MAXWELL & MOORE, INC. Muskegon, Michigan
Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

FACTORY / CATALOG NEWS
Begins on page 152

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

73—Closed-Circuit TV Equipment. Spiral-bound 35-pager shows cameras, monitors, amplifiers, mixers, remote control units, pans and tilts, lens turrets, iris controls, housings, lenses, accessories. Diagrams installations. Conduit capacity data. *Dage Television Div.*

74—Band Saws. Metal cutters ranging in capacity from 3½x6 in. to 12x16 in. are described in Catalog G-55. Automatic bar feed equipment, stock stands, accessories are included. Handy blade and speed selection chart for cutting various materials. 8 pages. *Wells Mfg. Corp.*

75—Hydraulic and Air Components. Pumps, cylinders, jacks, braces, rams, and other equipment, including custom-made types, are attractively presented in 36-page Catalog 55. Covers features, specifications, and applications. Discusses services of maker. *Star Jack Co.*

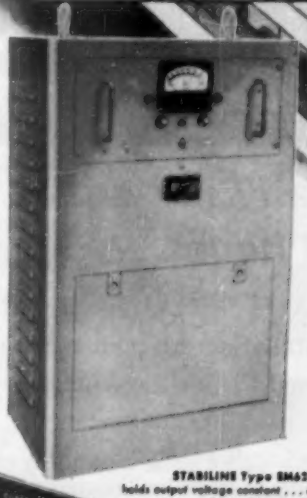
76—Cream Deodorant Soap. Data sheet contains 9-item question-and-answer discussion on this new soap with antiseptic, plus lanolin. Shows dispensing equipment combining soap, towel, dispenser; waste receptacle. *Sugar Beet Products Co.*

77—Woven Wire Products. Bulletin 111 shows woven wire conveyor belts; wire cloth for filtration sizing, screening, dewatering; special metal fabrications (crates, trays, baskets, racks); woven wire slings. *Cambridge Wire Cloth Co.*

78—Heat Machines. Self-contained, oil-burning units that can be plugged into any electrical connection are described in this 6-page folder. Details, specifications and application data on two models. Bulletin LL-2220. *R. D. Fageol Co.*

79—Vibration Mountings. Many models of "spring-flex" and pad-type mountings are shown in Catalog G-55. Adaptability and versatility of products are described. Chart for determining minimum deflection. 8 pages. *Vibration Mountings, Inc.*

How to Lower Production Costs in 101 Places BY GETTING RID OF VVT*



STABILINE Type SM6220Y
holds output voltage constant . . . ends
the troubles caused by
voltage variation.

*Varying *V*oltage *T*rouble can occur every time the applied voltage to any of your equipment varies — even within so-called "allowable limits". All too often the costly results of VVT are considered routine maintenance expense. The cause is never determined. The expense keeps recurring.

Whenever you use electricity to produce heat, light, power, sound, a STABILINE Automatic Voltage Regulator will assure that the equipment operates at the rating for which it is designed. When that happens your VVT's are over — *and you're saving money.*

Be sure to see Superior Electric's Mobile Display when it is in your area.

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A NEW CONCEPT IN INDIVIDUAL ROOM AIR CONDITIONING!

All living rooms and bedrooms in the 230 apartments of New York City's smart new Randall House, designed by Boak & Raad architects, feature Airtemp "All-in-Wall" Air Conditioners built right in.

Airtemp installs new "All-in-Wall" units in 420 rooms in new Randall house

AIRTEMP BUILDS AIR CONDITIONING TO FIT ANY REQUIREMENT! Now, for those buildings where a central air conditioning installation does not meet all of your needs . . . Airtemp has developed "All-in-Wall" air conditioning . . . A new concept in individual room cooling. Look at these exclusive "all-in-wall" features:

Quiet! Airtemp engineered for super-quiet operation—no distracting motor noise—inside or out.

Individual Room Control! Each unit can be controlled by the tenant. Automatic thermostat is standard equipment.

Flush Outside! No outside projection to mar the beauty of the building.

Full Window View! Unit is out-of-the-way *under* the window . . . extends only inches into the room.

Full Capacity! Extra-high cooling capacity is engineered by Airtemp to meet the demands of the hottest weather.

Easy Installation! Eliminates expensive on-the-spot engineering costs in new or old buildings.

Easy Maintenance! Inside access plus identical cabinet size for ½, ¾ and 1 H.P. models.

Individual Metering! Each tenant absorbs the cost.

All these services are yours when you air condition with Airtemp . . . The top engineers of Airtemp Construction Corporation—local Airtemp servicemen—plus on the spot personnel equipped to guarantee efficient operation through all the years ahead. Write Airtemp Construction Corporation, Dayton 1, Ohio, for further details.

Airtemp
DIVISION
CHRYSLER CORP

AIR CONDITIONING FOR HOMES • BUSINESS • INDUSTRY

Whatever the LIGHTING PROBLEM in front of you...

thousands of BENJAMIN Quality Lighting Systems assure you of a Superior Solution

1. "Explosion-Proof" Units
2. "Vapor-Tight" Incandescent
3. "Magna-Flo" Continuous Lines
4. "Lite-Line 40" Rows of Light
5. "Magna-Flo" w/27° Lamp Shielding
6. "RLM Dome" Reflectors
7. "Magna-Flo" w/Plastic Covers
8. "Elliptical Angle" Reflectors
9. "Steelite" Armor-Clad Units
10. "Magna-Flo" Individual Units
11. "Symmetrical Angle" Units
12. VOUL Units w/25% Uplight
13. All-white 'Diffuser" Reflectors
14. "Sky-Glo" Translucent Ceilings
15. "Stock-Bin-Lite"
16. "Officer" Louvered Units
17. "Panel-Glo" Plastic Ceilings
18. "Varsity" Low-Cost Fluorescent
19. "RD" Projectors
20. "Vapolets" Vapor-Tight Units
21. "Duo-Service" Floodlights

Superior Solutions to lighting problems require the *precisely right lighting system* for the seeing task and environment, plus *quality lighting units* built to deliver this lighting at lowest-per-year cost. With Benjamin you get both.

You get the precisely right lighting system, because Benjamin's line is so complete that thousands of different lighting systems can be created from it. You get lowest-per-year cost, because every Benjamin Unit has the quality and durability which 50 years of experience has proved to be essential.

Get a Superior Solution to your lighting problem! Start now by sending for FREE data bulletins on Benjamin Units for specific plant locations. Address:

Benjamin Electric Mfg. Co.
Dept. N, Des Plaines, Ill.

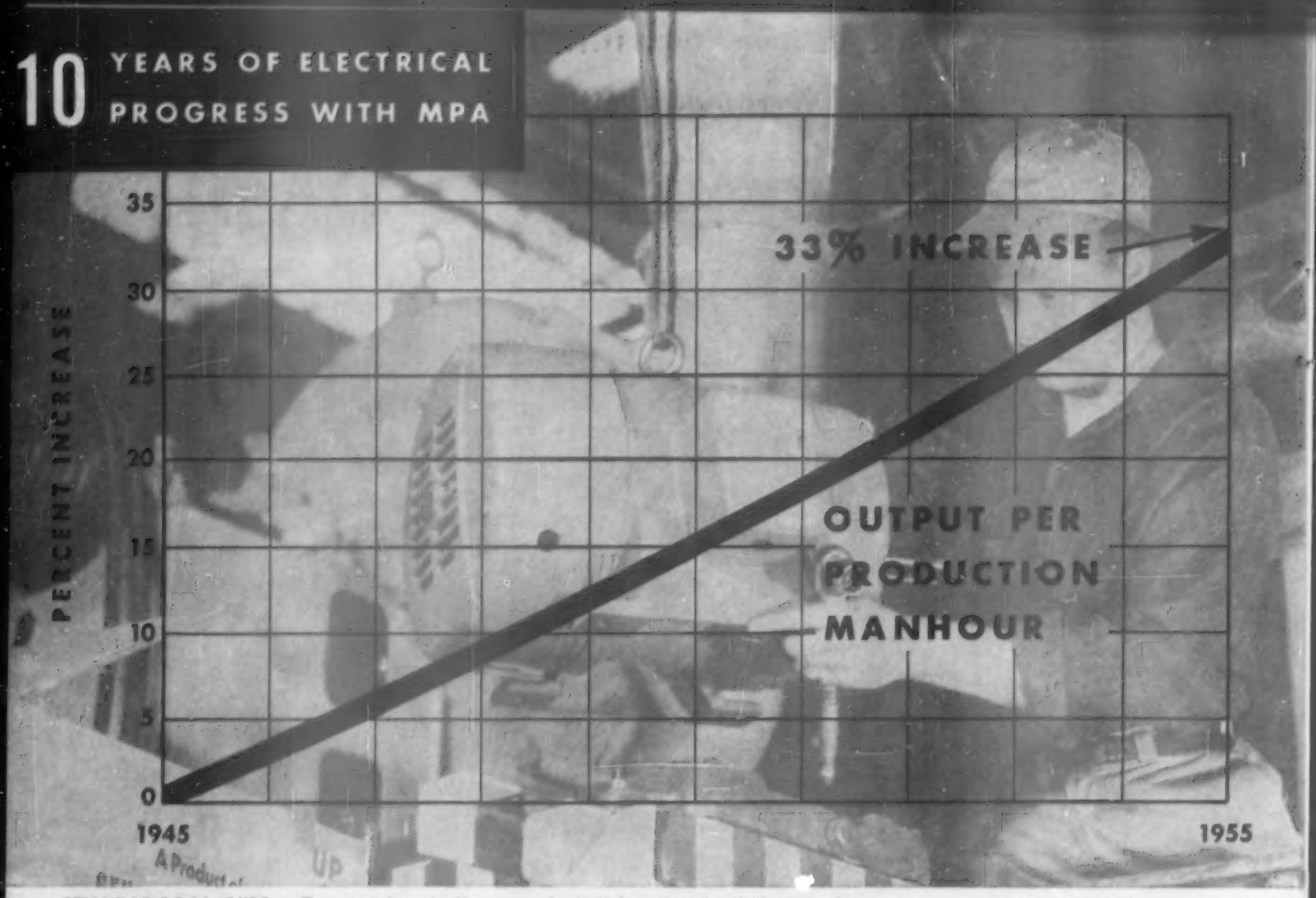
BENJAMIN

TRADE MARK

LIGHTING EQUIPMENT

Sold Exclusively through Electrical Distributors

XR-986R



TEN-YEAR GOAL of "More Power to America" program included helping industry achieve 30 percent increase in man-hour output by stimulating use of more electric power. American industry more than realized this objective with actual increase of 33 percent.

MPA films help you apply electric

Marking tenth anniversary of "More Power to America" program, General Electric pledges continued aid in industrial electrification

Ten years ago General Electric conceived and launched the "More Power to America" program. Strictly non-commercial, it was designed to help industry increase productivity and lower plant costs by helping to find new and better production techniques through expanded use of electric power.

Employing dramatic films, MPA programs quickly gained widespread usage in industry as mass informational and educational tools. Now, at the end of the first ten years, eleven different programs are in use in industry and several important new ones are being readied for release. During this decade industry has achieved a 33 percent increase in output per man-hour while use of electricity per man-hour increased from 4.7 to 9.6 kw-hrs. Many more programs are already planned to help you to even greater productivity in the coming ten years.

Incorporating the latest electrical ideas and techniques, each program consists of an instructive motion picture or slidefilm, an authoritative manual, and supplementary literature. This MPA series reflects the best co-operative thinking of electrical and machinery manufacturers, application and consulting engineers.

Available to you on either a loan or cost-purchase basis, these programs can be especially useful if you are planning plant expansion or modernization. If you wish to borrow any of these films or desire purchase details, contact your electric utility, call your local G-E Apparatus Sales Office, or mail coupon at right to General Electric Co., Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

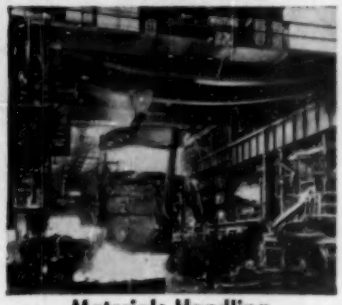
Arc Welding

Motor Selection & Application

Progressive Mechanization

Resistance Welding

Industrial Heating



Materials Handling

Electronics Training Course

Textile Program

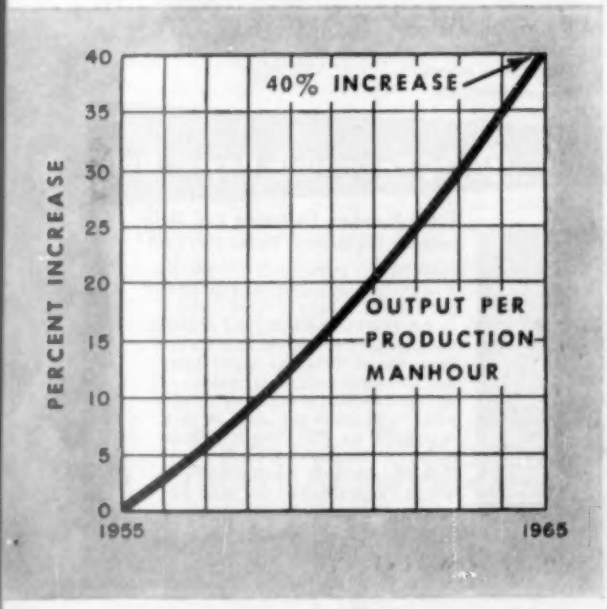
Power Distribution

Oil Field Electrification

Laundry Electrification

Call your electric utility, your G-E Apparatus Sales Office, or mail the coupon below

power to raise production output



NEW MPA PLANS call for new activities and programs to help industry raise man-hour output 40 percent in next ten years.

GENERAL ELECTRIC COMPANY
APPARATUS SALES DIV., SEC. A350-2
SCHENECTADY 5, N. Y.

I am interested in the following film programs:

√ for purchase details
X on a loan basis

- ☐ Arc Welding (27-minute, 16-mm motion picture)—$200
- ☐ Motor Selection and Application (Ten 10–30-minute, 35-mm slidefilms)—$100
- ☐ Progressive Mechanization (27-minute, 16-mm motion picture)—$200
- ☐ Resistance Welding (30-minute, 16-mm motion picture)—$190
- ☐ Industrial Heating (30-minute, 35-mm slidefilm)—$15
- ☐ Materials Handling (24-minute, 16-mm motion picture)—$175
- ☐ Electronics Training Course (Twelve 20–30-minute, 35-mm slidefilm)—$150
- ☐ Textile Program (26-minute, 16-mm motion picture)—$200
- ☐ Power Distribution (20-minute, 35-mm slidefilm)—$25
- ☐ Oil Field Electrification (30-minute, 16-mm motion picture)—$200
- ☐ Laundry Electrification (30-minute, 35-mm slidefilm)—$15

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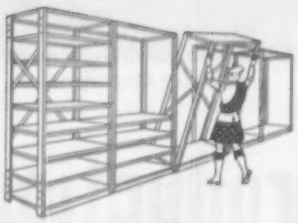
GENERAL ELECTRIC

No Steel Shelving is easier or quicker to assemble. No bolts or nuts are needed to assemble shelves. It's the most practical and most flexible shelving on the market. Saves time and money from first day of its installation.

BORROUGHS
STEEL SHELVING



* **Each individual unit is complete in itself .. no part depends on unit next to it .. any unit or shelf can be moved independently.**

send for new 32-page catalog

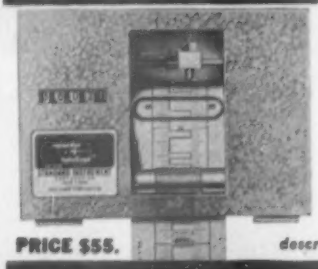
Flexibility is demonstrated in this partial view of the large Borroughs shelving installation at the Ford Division of the Ford Motor Co., Assembly Plant No. 2, Louisville, Kentucky.

A portion of the Borroughs shelving installation at the warehouse-carpet section of the J. L. Hudson Co. department store, Detroit, Michigan. Open end assembly permits easy storage of rolled stock.

BORROUGHS MANUFACTURING COMPANY
A Subsidiary of The American Metal Products Company of Detroit
3002 NORTH BURDICK amp KALAMAZOO, MICHIGAN

To be sure! **YOU CAN GET BETTER PRODUCTION IN YOUR PLANT**

TIME RECORDER-TOTALIZER



PRICE $55.

• This precision instrument provides accurate, permanent, chronological data about any machine, process or system in plant or office ...on a continuous chart-roll which lasts four months. Uses no ink. Totalizer shows accumulated "on" time.

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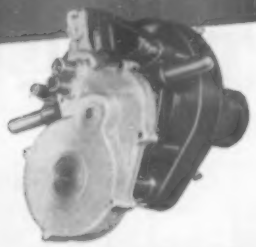
HEAT-TIMER corporation
657 BROADWAY, NEW YORK 12, N.Y.

NEW PORTABLE POWER UNIT!



SPEEDS PIPE THREADING

Powers all standard dies —threads up to 6" pipe or conduit in any position —pulls wire, powers winches, hoists, etc.

PORTA-Drive Reversible Power Unit

Every Plumber, Electrician and Maintenance Department Needs This Tool!

PORTA-DRIVE is a powerful, 20 to 1 ratio, gear drive unit designed to drive all standard geared pipe threaders. Powered by ½ inch electric or air drill, PORTA-Drive threads pipe 2 to 3 times faster than older methods, with much less labor. Fourteen-pound PORTA-Drive replaces larger, more complicated machinery in the shop ... yet rides comfortably in an ordinary tool kit to mechanize the outside work. Simple and quick to set up and use, PORTA-Drive gets in to do the work in close quarters where other methods couldn't work. Thousands sold—wihtout a single complaint. Your jobber can supply you. **Write for literature.**

MUNCIE GEAR WORKS, INC. Muncie, Indiana

This Armco Steel Building, 28 feet by 72 feet, makes an ideal office building for a manufacturing plant.

Office or Warehouse, Armco Buildings Serve You Economically

If you need a one-floor-plan industrial building—an Armco Steel Building will provide the economical answer. It combines low erected cost, minimum maintenance, and long life.

ANY FLOOR SPACE, FAST!

From 20 square feet up, you can meet practically any floor space requirement with an Armco Building. They are available in clear-span structures from 4 to 40 feet wide, and in multiple-span buildings for greater widths. There is a choice of heights, and building lengths are unlimited.

Erection time is measured in hours instead of weeks. Your own crew or any local contractor can do the job quickly. If you prefer, Armco will quote the building erected on your foundation.

LITTLE MAINTENANCE

There is nothing to warp, crack or rot with an Armco Steel Building. All STEELOX Panels are made of durable Armco ZINCGRIP that assures long life and minimum maintenance.

There is no worry about obsolescence. Armco Buildings are permanent structures, but have the added advantage that they can be dismantled and re-erected on new sites without loss of material.

Read this list of typical industrial applications for Armco Steel Buildings. Then write us for more data, mentioning the uses that interest you. Armco Drainage & Metal Products, Inc., 5485 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

CHECK THE BUILDINGS YOU NEED

- ☐ Warehouses
- ☐ Offices
- ☐ Machine Shops
- ☐ Watchmen's Shelters
- ☐ Welding Shops
- ☐ Drafting Rooms
- ☐ Locker and Wash Rooms
- ☐ Equipment Storage
- ☐ Repair Shops
- ☐ Telephone Booths
- ☐ Tool Houses
- ☐ Multiple Garages
- ☐ Time Offices
- ☐ Pump Houses
- ☐ Power Stations
- ☐ Fuel Storage
- ☐ Manufacturing Plants
- ☐ Fire Equipment Houses
- ☐ Loading Docks
- ☐ Foundry Buildings
- ☐ Food Service Buildings
- ☐ Gate Houses
- ☐ Maintenance Buildings
- ☐ Explosive Storage
- ☐ First-Aid Stations
- ☐ Cafeterias
- ☐ Shipping Rooms

Armco Steel
BUILDINGS

ARMCO

Kimwipes

—the improved industrial wipers

Wipes clean without linting, scratching or streaking!

Soft! Kimwipes' texture makes it ideal for wiping even the most delicate, highly-polished surfaces.

Extra absorbent! Each wiper will hold 8 times its own weight in oils, liquid spills of all types.

Disposable! There are no laundry bills—no holdover of infectious material to cause dermatitis!

Economical! Each sheet gives 4-10 times more wiper area for your dollar than laundered cloths.

Get Kimwipes from your distributor, today!

And here's another Kimberly-Clark product for you— Kimpak Interior Packaging. Its superior shock-absorbency gives products far more protection, yet costs no more than ordinary packaging materials!

Kimberly-Clark Corporation · Neenah, Wisconsin

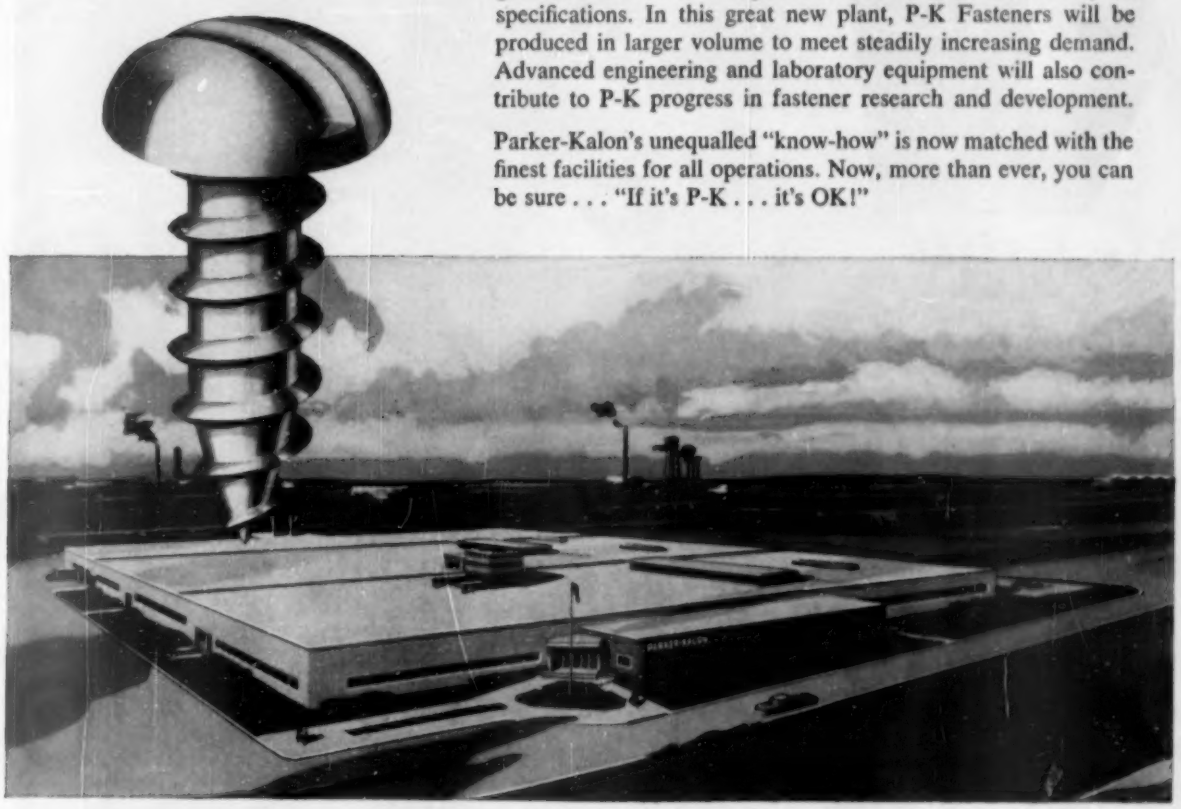
the new PARKER-KALON plant

Production facilities matched with an unequalled experience ... to offer you more assembly savings

Starting with a revolutionary idea, the *original* Sheet Metal Screw, Parker-Kalon has become the leading manufacturer of Self-tapping Screws and other fasteners essential to low-cost assembly of thousands of products.

Industry's reliance on Parker-Kalon has brought about this growth, and the new P-K plant, in a real sense, was built to your specifications. In this great new plant, P-K Fasteners will be produced in larger volume to meet steadily increasing demand. Advanced engineering and laboratory equipment will also contribute to P-K progress in fastener research and development.

Parker-Kalon's unequalled "know-how" is now matched with the finest facilities for all operations. Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"



PARKER-KALON DIVISION • General American Transportation Corporation, Clifton, New Jersey

IN CLIFTON, N. J. About 10 miles from New York City.

267,000 SQUARE FEET of floor space, with 225,000 sq. ft. for manufacturing: the remainder for offices, shipping, etc.

PRODUCTION-FLOW DESIGN Single-story construction, with layout that permits progressive flow of products through processing operations.

MECHANIZED MATERIALS-HANDLING Special conveyor systems and other modern equipment provide advanced degree of automation, and speed production.

AUTOMATIC HEAT-TREATING equipment, of P-K design, is typical of new production facilities for highest efficiency.

ADVANCED QUALITY CONTROL Newest inspection and testing equipment guards P-K quality standards.

PACKING AND SHIPPING area is fully equipped for rapid handling of large stocks and shipment of orders.

AIR-CONDITIONED LABORATORY provides all modern requirements for research, fastener development, and performance tests.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS

ONLY TWO STRIPS REQUIRED

Because of its unusual strength, only two strips of TROJAN Cord Tape are required to seal many boxes. This saves time, material and labor in making the closure.

Let us send you full information about TROJAN Cord Tape, the official railroad, truck, express and parcel post box sealing requirements, and the name of a local paper merchant who can supply you with TROJAN Cord Tape. TROJAN Cord Tape may be applied with automatic sealing machinery. . . approved under Rule 41 Uniform and Consolidated Freight Classification. Write today.

TROJAN CORD TAPE

The GUMMED PRODUCTS COMPANY

Specialists in the gumming of printing papers, foils and sealing tapes.

Main Offices and Mills: TROY, OHIO

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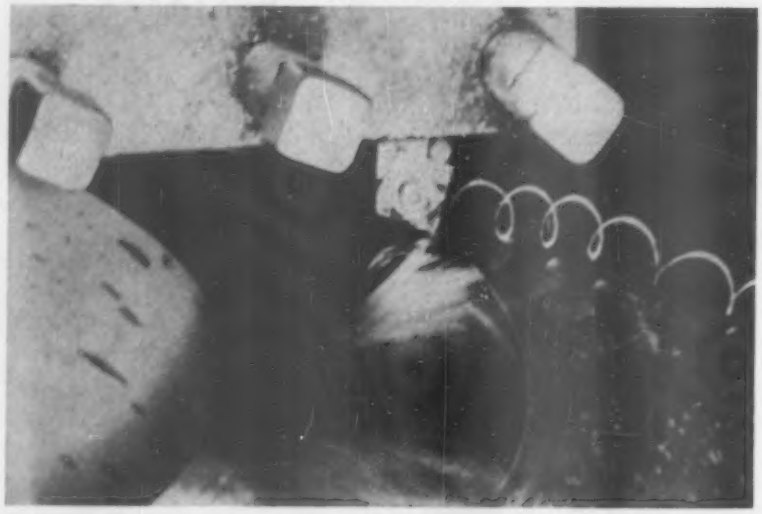


HIGH FINISH on difficult-to-machine chrome moly steel is obtained with Carboloy's new cemented oxide tool. Wear is only a fraction of that with carbide tools.

Oxide Tools Take Higher Speeds

New cutting-tool material proves successful for machining harder metals at higher speeds.

Next month a new type of cutting-tool material makes its commercial debut. Potentially, it can rock current concepts of high-speed finish machining. Finishing speeds now rarely go beyond 500 surface feet per minute. Cemented-oxide tools have been tried and proved at speeds of 2500 sfpm—and are expected to extend the range to 7500. Will cut hard steels up to 300 Brinell.

The material is lightweight, has a grain size of less than 2 microns, and a hardness of 93 to 94 on the Rockwell A scale. Tool life of 25 times that of carbides has already been measured in comparable applications. Cemented oxides are produced by powder metallurgy, using abundant materials.

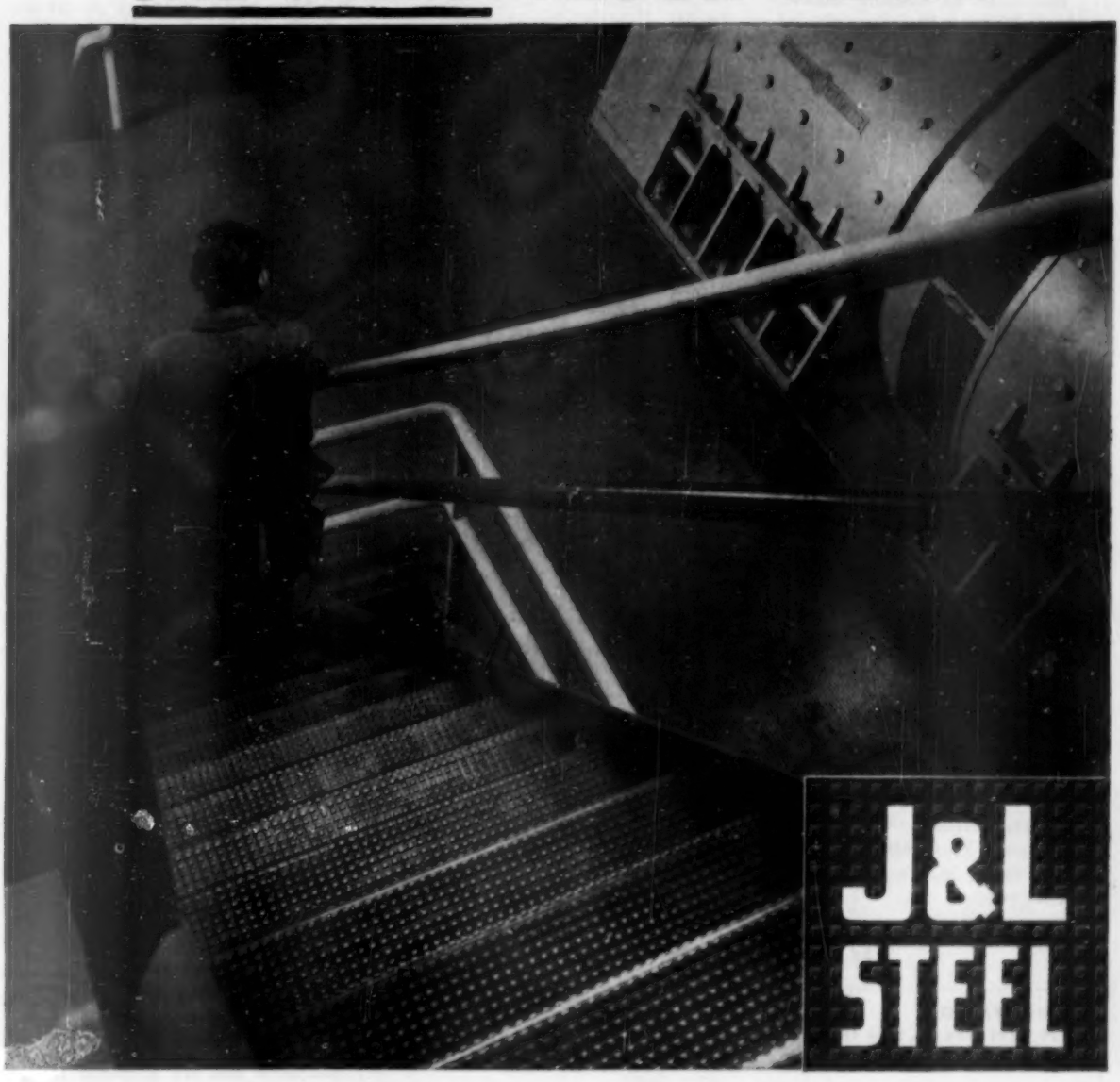
Carboloy Dept., General Electric Co. (Circle 1, Reader Service Card.)

More Applications for Flame Plating

Now you can treat metal parts and tools to a hard, thin, wear-resisting coating of tungsten carbide—for greater service life. In one tested application, screw machine feed finger pads last 15 to 20 times longer than hardened steel parts. Also gives other tools many times their usual wear life: knives for cutting rubber, meat, paper, and plastics; core rods for powder metallurgy; non-corrosive seals for high-speed shafts; special gages, dies, and blocks; gripper dogs for banding machines—to mention just a few examples.

Process: Oxygen, acetylene, and tungsten carbide powder are ignited in a special gun. The detonation hurls particles out with sufficient heat and pressure to interlock them metallurgically with surface of metal being plated. Unlike brittle, solid

NEAT WAY TO PLAY SAFE:
JAL-TREAD FLOOR PLATE



Jal-Tread floor plate combines the strength and durability of high quality steel with a neat, distinctive checkerboard pattern scientifically designed for *safety*.

Whatever your application . . . in new construction . . . new equipment . . . or replacement jobs, Jal-Tread will assure you of these advantages:

Safe Footing—300 miniature squares per square foot—all of uniform height—provide maximum linear friction surface that protects you against lost-time accidents.

Easy Fabrication—The Jal-Tread straight line pattern simplifies welding, flanging, shearing, bending, punching, and drilling operations. Experience shows that Jal-Tread can be cold-formed on standard plate bending machines.

Easy Cleaning—The Jal-Tread straight line gutter pattern permits quick, thorough sweeping and draining in any direction.

For safe, long-lasting flooring always specify J&L Jal-Tread . . . *it's available at leading distributors everywhere.*

see our catalog in 9 ARCHITECTURAL FILE or write for copy

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

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Begins on page 266

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carbides, flame-plated surfaces are flexible and elastic — deforming slightly with the base metal without chipping or cracking. Can be applied to different metals —to combine wear resistance with the easy machinability of brass, the toughness of steel, or the lightness of aluminum, magnesium, or titanium.

Linde Air Products Co. (Circle 2, Reader Service Card.)

3—Colored Aluminum stock is now available on a large scale. Preanodized sheet, tube, extruded shapes, bar, rod, fasteners come in red, blue, green, yellow, gray, brown, gold, black metallic finishes. Two classes of finish serve for decorative and architectural applications. *Aluminum Co. of America.*

4—Reinforced Plastic sheeting called "Scotchply" is a glass-in-plastic laminate. Moldable, high-strength, and machinable, material comes ready for use in production applications. A 20-page reference manual describes advantages, applications, procedures for use. *Minnesota Mining and Mfg. Co.*

5—Cadmax brightener for cadmium plating comes as a concentrated liquid. Eliminates breakdown products and organic impurities in barrel-and-still cyanide cadmium plating. Low foaming. Produces clear, brilliant, blue-white deposits. Also prevents burning of plated parts, even when the cadmium content of the bath reaches a low point. *American Smelting and Refining Co.*

6—Snow and Ice Removal is easy with DX-27. Rust inhibitor makes it harmless to tires, gutters, steel fence, rails, shoes, and vegetation—as well as to other corrosive metal products. Melting action is fast with DX-27 pellets. And they leave no messy residue. *The Dasco Chemical Co., Inc.*

7—Triangular-Shaped barrel finishing material won't become wedged in parts being tumbled. Permits fin-

A penny saved is a penny earned – *maybe!*

Any businessman knows that
saving a few pennies here
can cost a few dollars there.

We've all seen it demonstrated time and again—an inferior product that won't do the job can wind up costing money. As a matter of fact, this old business axiom is being proved in many company washrooms right now.

If the washroom is stocked with low-priced paper towels that go to pieces when wet . . . or if the towels are too stiff to soak up water . . . *then they're not saving a cent.* People will grab a fistful of such towels every time they wash up.

You can expect lower consumption with a quality towel

ScotTissue Towels are not the lowest priced towel on the market, but *one ScotTissue dries two hands.* People don't have to reach for a second towel. This means consumption is lower—and so are your towel bills.

The ScotTissue Towel combines many qualities—such as fast absorbency, wet-strength, stretch, softness and whiteness—which mean much more towel for your towel-buying dollar.

Scott boosts employee morale

People buy more Scott products for their own use than any other brand. So naturally it's the brand they like to see provided where they work. According to a recent survey, good washroom facilities are one of the four main essentials for good employee relations.

Your nearest Scott representative can tell you why ScotTissue Towels will give you lowest towel consumption, greatest employee satisfaction, and lowest towel costs, all things fairly considered. Also, Scott offers a "Planned Poster Program" which you will find helps to cut down consumption, and promote cleanliness in your washrooms. This program can be yours without obligation—write to Scott Washroom Service®, Scott Paper Company, Dept. FM-12, Chester, Pa.

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SCOTTISSUE® TOWELS

For a Small, Localized Supply of Warm or

HOT WATER

Use

POWERS

STEAM and WATER MIXERS

ECONOMICAL – Quickly pay back their cost. Thousands now in use. *Easy to install.* Requires steam and water pressures above 10 lbs. Steam is mixed directly with water.

USES – Barrel washing, truck washing, sterilizing rinse water for dishwashers and many industrial processes.

TEMPERATURE RANGE – Any temperature desired between that of incoming water and 200°F.

HAS PRESSURE EQUALIZING VALVE – which prevents delivery temperature changes caused by fluctuating pressures of steam or water.

SMALL SIZE – ½" pipe size can be held in the palm of the hand, weighs 7 lbs., ¾" size weighs 16½ lbs.

CAPACITIES – based on steam and water at 45 lbs. pressure each, water at 60°F., and delivery temperature of 120°F.: – ½" size = 5 gals. per min.; ¾" size = 11 gpm. Mixing steam with 140°F. water increases delivery volume about 75%. Often used as a small booster heater.

WRITE for bulletin 369

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THE POWERS REGULATOR CO.
3400 Oakton Street Skokie, Illinois

Please Send Bulletin 369.

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ishing intricate parts—with holes, slots, recesses. Tumblex "T" consists of Alundum vitrified bonded triangular-shaped abrasive. Another, Tumblex "N", is a natural material developed especially for finishing die castings—where some abrasives cut through outside protective layer and expose porous structure beneath. *Norton Co.*

8—Heat-Insulation material withstands temperatures to 1800 F. This hydrous calcium silicate product is recommended for covering pipes and vessels. Kaylo-20 is lightweight, easily worked—is readily distinguished from company's standard Kaylo, a material that is effective up to 1200 degrees F. *Owens-Illinois Glass Co.*

9—Fluid Epoxy Resin will retain a pot life of 8 days when mixed with hardener. Useful for assembly operations where numerous pours are to be made. Potting and encapsulation of electrical components or filling large mechanical castings, for example. Epocast 13 cures at 200-250 F. *Furane Plastics, Inc.*

10—Aqua-Bond coating offers protection against damp walls. Good for any surface where moisture is a problem. The polyvinyl acetate latex emulsion is blisterproof because it "breathes." Allows moisture vapors to escape through the film. Also prevents passage of moisture through the film from the outside. Resists acids, alkalis, mildew—is non-chalking and odorless. Won't become brittle with age. *Joseph Dixon Crucible Co.*

11—Nickel-less stainless steel is in the offing, according to one researcher. By proper control of the chemical composition and a greater use of nitrogen, quality ingots can be made. Discovery may pave the way for increased use of stainless—both as a substitute to combat nickel shortages and for other specialized applications. *U. S. Steel Corp.*

12—Rubber-Fiber adds oil-resistant synthetic rubber sizing to vulcanized fiber. Type RS-10H is 70 per cent more compressible and 69 per cent more resilient than conventional vulcanized fiber. Opens new opportunities for a gasketing, packing, and facing material. Has higher coefficient of friction and improved chemical resistance as compared to conventional fiber. *National Vulcanized Fibre Co.*

13—Nicrobraz stainless steel brazing alloy is now available in paste form. Easy to apply and work. Can also be used in brazing other nickel-base and cobalt-base alloys—as well as carbon steels and copper. Applied by brush, dip, or other applicator. Material is mixture of nickel-chrome-boron alloy powder and cream-type flux. Comes in grades for different applications. *Wall Colmonoy Corp.*

14—Epoxy Laminate has high electrical insulation, dimensional stability, and is free from crazing. Phenolite G-10-860 is a glass-base sheet laminate, bonded with epoxy resin. Especially suited for electrical and electronic devices. Can be obtained with copper foil on one or both sides for printed-circuit work. *National Vulcanized Fibre Co.*

15—HET Anhydride cures liquid epoxy resins. Offers fire resistance and high-temperature strength heretofore unavailable. Resulting material also retains good electrical characteristics at high operating temperatures. Expected to further increase the uses for epoxies—for casting and potting of electrical equipment, as backings for printed circuits, as varnish-type insulation, in tool and die work, as well as in various other applications. *Hooker Electrochemical Co.*

16—Permite Rust-Blok combines a rust inhibitor with aluminum paint and a waterproof Bakelite phenolic resin. One coat primes and finishes—lasts 4 to 7 years. Reduces surface preparation time, spot priming, spot touch-up, repainting. Prevents rust from growing and spreading. *Aluminum Industries, Inc.*

AIR engineering at work
REPORT No. 4400.05

Running Ten Nuts at a Crack...

SAVES $12,000 *a year!*

This large auto manufacturer formerly used two ¼ ton presses to position a differential carrier in the rear axle housing. Then the ten ⅜" nuts were run individually. Only experienced operators could control torque so that it met specifications. Naturally the engineers wanted to eliminate the press operation and improve torque control.

AIR engineering by Ingersoll-Rand provided the answer and saved $12,000 a year. A 10-Spindle Multiple Nut Runner is now suspended over the moving conveyor. The differential carrier is hand set on the housing, and dropped to within ⅛" of its final location. The 10-spindle nut runner quickly and accurately draws it into final position as it runs all 10 nuts at once . . . and to the required 50 ft. lbs. torque. The press operation is eliminated, and simultaneous running of the nuts eliminates binding.

If you are in any way responsible for cutting costs in your plant, write us on your company letterhead, and we will arrange for you to see I-R's confidential manual of reports on "AIR engineering at work".

Ingersoll-Rand Multiple Nut Runner runs 10 nuts at once, all to exact torque.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

AIR engineering Manual

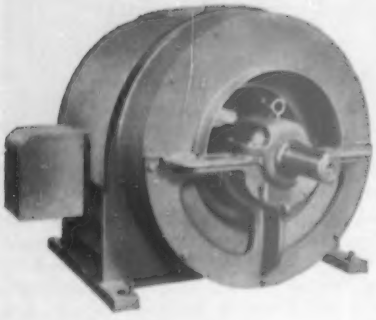
Don't miss over 100 interesting case history applications of AIR engineering in this confidential manual.

8-147

All of the bars of this squirrel-cage rotor are being joined simultaneously to one end ring by the Westinghouse high-frequency brazing process. The end ring is heated by high-frequency currents induced by the coil on which it rests, and conduction carries heat to the bars. This process inspects itself . . . the red-hot bars are clear proof of positive joints.

A big extra in large motors . . .

Westinghouse special brazing process boosts rotor reliability, slashes maintenance



This is a large standard type CSF drip-proof motor. It can easily be modified to meet any special mechanical-drive requirement.

High-frequency brazing eliminates rotor joint failure . . . proved on over 1500 motors operating up to five years without a single failure

This technique licks the biggest single trouble spot in rotors of large motors. Bars are brazed to the end rings—and connections are tested at the same time. It is the only way to get solid, indestructible joints . . . your positive assurance of reliable operation under the toughest conditions.

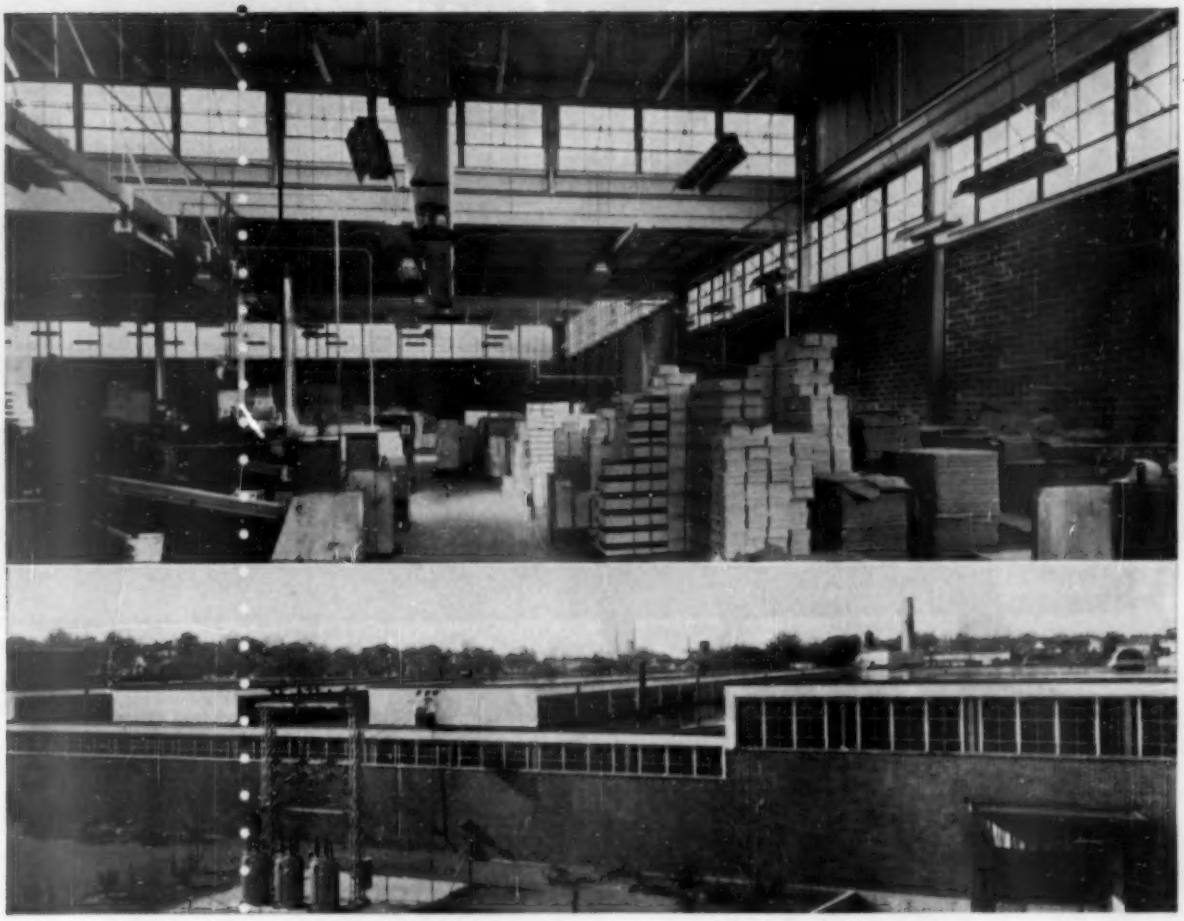
You get many important extras in Westinghouse large motors. Thermalastic® insulation, for example, gives over 20% increase in dielectric strength, 10-to-1 increase in voltage endurance — withstands moisture, dust and corrosive atmospheres.

Both of these features have been extensively proved in service. They give you a motor far superior in performance and long life . . . the closest you can come to a completely maintenance-free mechanical drive. For full range of sizes and application assistance, call your local Westinghouse sales engineer, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-10444

YOU CAN BE SURE . . . IF IT'S

Westinghouse

COOLITE GLASS BRINGS COMFORT BY THE ACRE



Moscowitz, Wilner & Millkey, Architect. J. A. Jones, Contractor.

Montag's New Paper Plant Keeps Bright and Comfortable Under 24,000 Sq. Ft. of Coolite

Montag, maker of fine stationery and school supplies for 65 years, recently occupied its new plant.

The Montag building covers 280,000 square feet and was designed to be the most modern stationery and school supply plant in the world. Conceived as an ideal plant for people and machines, it provides finest lighting, heating, humidity conditions and employee working and recreational facilities.

To achieve these aims, it is copiously daylighted with over 24,000 square feet of Coolite Glass by Mississippi. Coolite not only provides high levels of comfortable illumination, diffusing harsh sunlight for visual comfort . . . it absorbs much of the unwanted and uncomfortable solar heat rays, helps keep the vast interior cooler on brightest days.

Employees feel better, see better, work better under Coolite . . . for Coolite filters out unwanted harsh qualities of "raw sunlight" . . . permits extensive use of glass for low cost daylighting without undue heat.

In new construction or modernization, specify translucent light diffusing glass by Mississippi. Manufactured in a wide variety of patterns and surface finishes to help you solve any daylighting problem. See your nearby distributor of quality glass.

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WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

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This Aquadam Asbestos Smooth-Surface built-up roof—like its companion product, the slag- or gravel-surfaced Aquadam roof—offers the extra protection of new, high-bond-strength Aquadam.

Aquadam Built-Up Roofs

in a slag-gravel or a smooth-surface specification

(for deck inclines from dead level to ½" per foot)

Johns-Manville Aquadam built-up roofs have been specifically developed to give the best possible protection to a building. Before publicly announcing Aquadam roofs, Johns-Manville has thoroughly tested the specifications in the field over a period of years.

Aquadam built-up roofs—in slag or gravel, or smooth-surface specification—owe their superiority to Aquadam—the bituminous asphalt cementing agent developed exclusively by Johns-Manville for use in the application of the roofing felts.

Accelerated weathering tests have proved Aquadam to be nearly twice as resistant to excessive exposure as other bitumens. In standard ductility tests Aquadam proves its greater resistance to cracking, by exhibiting more than 100% greater ductility than other bitumens. In addition, Aquadam offers improved self-healing properties, stronger bond, greater resistance to water, excellent uniformity—PLUS important installation advantages such as greater kettle stability.

For information about Aquadam Built-Up roofs, see your Approved Johns-Manville Contractor. He's listed in the classified telephone directory. Or write Johns-Manville, Box 158, New York 16, N. Y. In Canada: 565 Lakeshore Road East Port Credit, Ontario.

See "MEET THE PRESS" on NBC-TV
sponsored on alternate Sundays by Johns-Manville

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

"I'm never 'Small Fry'..."

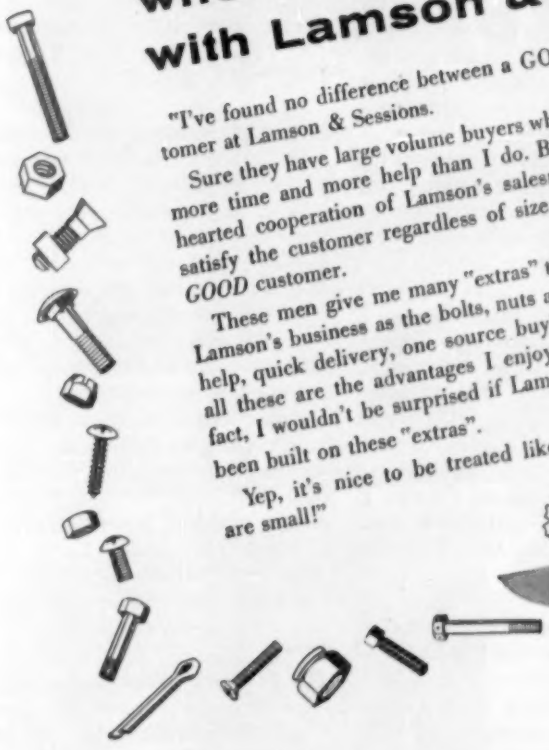
when I do business with Lamson & Sessions"

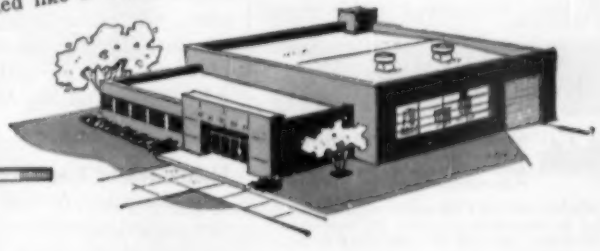
"I've found no difference between a GOOD customer and a BIG customer at Lamson & Sessions.

Sure they have large volume buyers who perhaps require more service, more time and more help than I do. But I, too, enjoy the same wholehearted cooperation of Lamson's salesmen whose only incentive is to satisfy the customer regardless of size. To them *EVERY* customer is a *GOOD* customer.

These men give me many "extras" that seem to be as much a part of Lamson's business as the bolts, nuts and screws themselves. Engineering help, quick delivery, one source buying, pleasant congenial people . . . all these are the advantages I enjoy when I do business with them. In fact, I wouldn't be surprised if Lamson's leadership in the industry has been built on these "extras".

Yep, it's nice to be treated like a "big shot" even when my orders are small!"





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Flammables

STORE SAFE and POUR SAFE

with this Approved Double-Duty Safety Container!

PROTECTOSEAL

STOR-por

Dispenser

combines the functions of a Safety Can with those of a Supply Can to perform both services with one piece of equipment—eliminates cost of an extra can—does away with necessity of using a funnel with its lack of control and possibility of dangerous spillage.

The Protectoseal Stor-Por Dispenser is Underwriters Laboratories and Factory Mutual Laboratories approved. Both fill opening and pouring spout have double perforated metal fire baffles to prevent ignition of contents. Easy-working valve at base of flexible spout is operated by carrying hand and gives positive control while pouring. Available with ¼" and ⅜" flexible hoses in 1- and 2-gallon sizes, and ⅜", ½" and 1" flexible hoses or rigid spouts in 3- and 5-gallon sizes.

Protectoseal is the one COMPLETE source of approved equipment for all flammable operations—Production—Storage—Dispensing.

All Protectoseal Fire Preventive Equipment is designed by specialized engineers for time-saving and convenient use, and in most cases actually speeds production.

Send for NEW Flammables Equipment Guide Chart. Illustrates and describes 30 approved Fire Protective Safety Devices and their uses.

Fill in coupon and attach to company letterhead. West Coast Warehouse: Los Angeles, Calif. In Canada: Safety Supply Co.—Toronto.

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1962 S. Western Ave., Chicago 8, Ill.

Without cost or obligation, send "A Guide to Selection and Use of Protectoseal Equipment for the Safe Storage, Handling and Use of Flammables."

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FACTORY | NEW BOOKS

Preventive Maintenance of Electrical Equipment—Both important phases of any maintenance program—the preventive side, and emergency repair side—are covered in simple, clear, and concise style in this book.

The volume should be useful to operating engineers, maintenance electricians, and other plant executives whose responsibility it is to keep the plant's electrical gear running and in good condition. Part I—preventive maintenance—describes a program for maintaining motors, generators, controllers, electronic apparatus, batteries, transformers, fluorescent lighting, and the like. Part II—trouble-shooting methods—emphasizes emergency repairs that will keep equipment in operation until it can conveniently be scheduled out of service.

A third major section outlines the correct operating techniques for most major electrical apparatus, as an invaluable method of eliminating need for maintenance.

The book also includes good coverage of electrical insulation; has a most interesting illustrated section on identification of electrical apparatus that should be a real help to many; and the latest ASA, AIEE, and NEMA standards for testing, evaluating, and connecting electrical apparatus. *By Lt. Cmdr. Charles I. Hubert. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 214 pages. $4.*

Handbook of Engineering Materials—In these days of new materials and new-material problems, a book that presents in one place the properties of all the important metals and nonmetals should prove useful. This handbook was developed because the editors felt the conventional, specialized handbook no longer served the engineer efficiently, since—nowadays—the engineer in one field is constantly working with materials from another. For example, the electrical engineer must often know about plastics; and the chemical engineer finds himself concerned with the electrical properties of the materials he works with.

The handbook discusses electrical, thermal, physical, chemical and other important properties of the materials. Information is arranged to make comparisons of competitive materials easy—so should be of real help in computing costs.

The book is divided into four main sections: 1) general information, specifications and standards, statistics on application; 2) metals—including ferrous and non-ferrous, alloys of all kinds; 3) non-metals—such as wood and wood-base materials, paper, fibers, plastics, rubbers, ceramic materials, and so on; 4) construction materials. *Edited by John Seastone and Douglas F. Miner. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 1382 pages. $17.50.*

Industrial Maintenance Painting—This little book is filled with practical hints, methods, and cost information on industrial painting. Its purpose: to help plant men in the intelligent selection and application of protective coatings. Happily, the book steers away from the technical language and theory used by corrosion engineers and chemists in discussing painting problems. Covers surface preparation, protective coatings, coating application, inspection, comparative costs, shop painting of steel, and other subjects. The emphasis: practical, non-theoretical information. *By Paul E. Weaver. American Printing Co., Ltd., 424 Camp St., New Orleans. 82 pages. $3 (less in quantity).*

The Foreman's Handbook—This is the third edition of this well-known handbook. Here, your foreman will find the practical facts he must know to solve most of the problems that will arise in his daily operations. Twenty-four experts contributed on their specialties. Each chapter can be read independently, but all are interrelated and presented in logical order. The new edition covers latest developments in statistical quality control, predetermined time standards, the "standard-minute system" of incentive wage payment, a practical combination of

CUT THE COST

of "keeping things moving"

Money "goes down the drain" quickly when production slows or stops anywhere along the line. You can prevent production bottlenecks with *your own* "inside" telephone system!

The P-A-X Business Telephone System is a separate network of dial telephones—*owned* (not rented) to serve every part of your plant. Through P-A-X, executives and production supervisors can gather facts and issue instructions in seconds, to anticipate *and prevent* expensive roadblocks in production before they happen. P-A-X service is "person-to-person" contact in its fastest, most convenient form—reduces paperwork, saves time, *keeps things moving!*

Thousands of companies find that P-A-X is an investment that pays off, every working day. For an objective case study of P-A-X at work in a plant much like yours, write: Automatic Electric Sales Corporation, (HAymarket 1-4300), 1033 West Van Buren Street, Chicago 7, Illinois. In Canada: Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

Learn how a leading manufacturer uses P-A-X to improve production control—and cut costs. Write for a copy of this illustrated case study today.

AUTOMATIC ELECTRIC

ORIGINATORS OF THE AUTOMATIC TELEPHONE

Want Some Real Job Help?

Here's a list of reprints which have already proved their value to FACTORY readers.

The subjects covered in these reprints are varied. Many of them you might wish to have for your own personal library. Others you may want to order in larger quantities for distribution to people in your organization. All the articles listed here in stock, in limited quantities. First come, first served.

Write to: Editor, FACTORY

How to Use Your Time Better
How to Improve Your Memory
How to Rough Sketch Your Ideas on Paper
How to Read Faster and Better
Tips on Talking Better
Work Sampling**
Sonic Energy**
How You Can Use Radioisotopes**
How Good A Leader Are You At Getting Better Production
How to Pick People Better
Telling Employees Where They Stand
How Good a Leader Are You
How to Solve Your Parking Problems
Organizing for Disaster
How to Protect Your Plant Disaster Without Warning
How Fixed Variable Cost Control Helps Produce Profits
Special Report on Incentives for Supervisors
Followership—New Step to Better Leadership
How's Your Health?
Get Tooled up Now to Cut 1955 Costs
How to Think and Act Like an Executive
How to Start a Training Program from Scratch
10 Tools to Control Vendor's Quality
Worker Psychology — A Formula That Works
Predetermined Time Standards
How to Write Better Letters to Employees
Electronic Controls
Cuts Rejects and Inspection Cost
G M's Fire**
Merit Rating Plan for Executives
How to Be Interviewed
Operations Research
The Sad Case of Company X
What to Do When the Union Knocks at Your Door
Factory's Cost Index**
Role Playing in Training Supervisors
Six Steps to Better Inventory Management
Make Statistical Methods Easier to Understand
Your Ideas: How to Put Them Across
Nine Steps to Better Quality
Work Sampling Without Formulas
Squeeze is on Production Supervisor
Writing Reports that get Action
Newest Way to Figure Payoff
What Automation means to America
Universal Maintenance Standards
More from your Suggestion Plan
18 Ways to lower Maintenance Costs

Prices for all reprints listed above, are:

Single copies—35¢ each	**Single copies—50¢ each
100-299 copies—25¢ each	100-299 copies—35¢ each
300-499 copies—20¢ each	300-499 copies—25¢ each
500 copies up—15¢ each	500 copies up—20¢ each

Shipping charges will be added to all orders for over 50 copies.

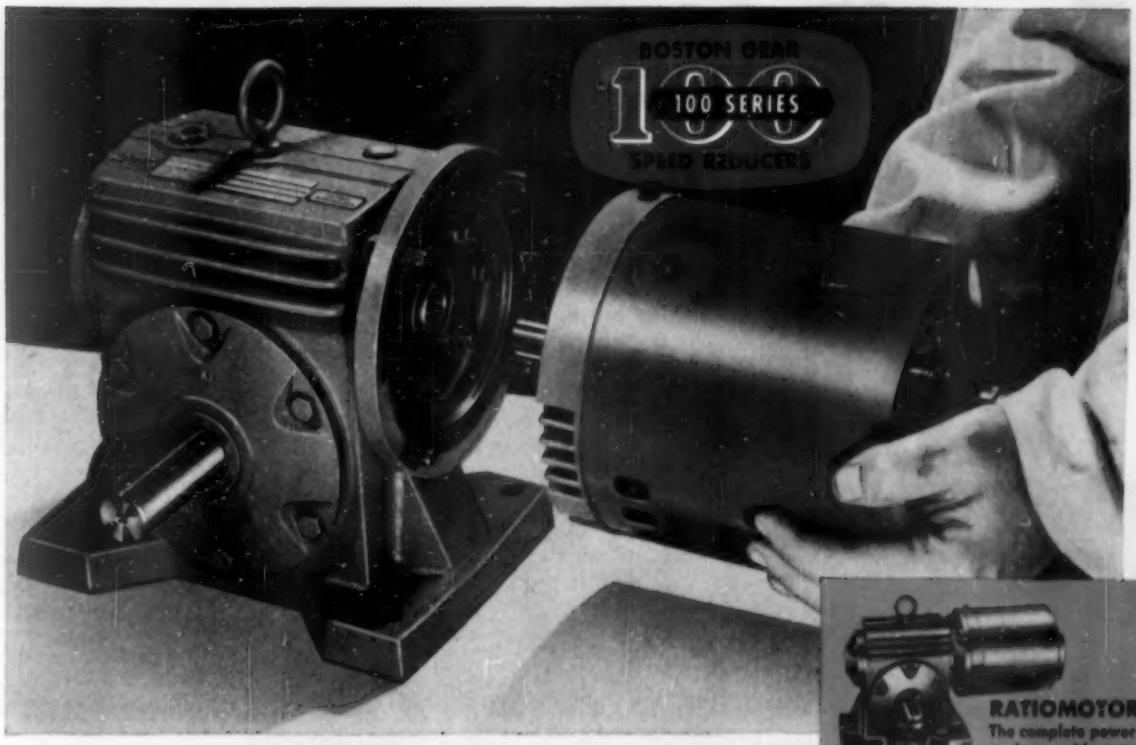
Begins on page 276

the point system and factory-comparison techniques in job evaluation. and so on. *Edited by Carl Heyel. McGraw-Hill Book Co., 330 West 42nd St., New York 36. 577 pages. $6.50.*

BOOKLETS

The Case Solution Group for Learning Problem Solving—For those interested in setting up a foreman-training program using the case method, this booklet should prove invaluable. It outlines the advantages of the case-study training method, procedures for enrolling and developing a case-solution group, reaching case-problem solutions, using the case-solution method to establish basic principles, conducting the discussion at the first session, formulating and handling a program. Special emphasis is placed on the group leader's responsibilities. Twenty-nine tested case problems are included in the appendix. *A project of the Education Committee of the National Council of Industrial Management Clubs. Association Press, 291 Broadway, New York 7. 36 pages. $1.50.*

Standards for the Installation of Sprinkler Systems—Since NFPA recognition has been given to a new spray sprinkler (which utilizes water more efficiently for fire-extinguishing purposes than previously available sprinklers), the industry has ceased manufacturing the old type, and thus the current standard recommends only the spray sprinkler for industrial purposes. The standard includes general information on sprinkler systems, how to classify various properties according to their fire hazards, preparation of buildings prior to making sprinkler installations, water supplies and fire department connections, and recommended specifications on piping, valves, pipe fittings and hangers, sprinkler temperature ratings, location and spacing of sprinklers, dry-pipe and preaction systems, sprinkler alarms, and so on. NFPA Standard No. 13. *National Fire Protection Association, 60 Batterymarch St., Boston. 162 pages. $1.*



New COST-SAVING "COMBINATION"

for certified efficiency—easy maintenance —and unlimited adaptability

The new 100 SERIES RATIOMOTOR combines a gear reduction unit and an easily detachable, standard end-mounted motor.

MOTOR CAN BE REMOVED and replaced in a few minutes, without disturbing the gear reduction unit. Saves maintenance time, preserves alignment, permits continued operation with spare motor.

ORIGINAL MOTOR CAN BE CHANGED When conditions require change to a motor of special characteristics (totally enclosed, explosion-proof, etc.) it can easily be attached in place of the original motor.

ANY MODEL NEEDED – FROM STOCK The 100 SERIES includes 1064 different *standardized stock* units for an unlimited range of applications . . . Reductors, for mechanical drives, as well as Ratiomotors and Flanged Reductors. All ratings are *certified* to be actual torque delivered, by Independent Laboratory tests.

A BOSTON GEAR FIELD ENGINEER will help you simplify planning, and put your product ahead in design. Your Boston Gear Distributor will arrange a call, or write: Boston Gear Works, 62 Hayward St., Quincy 71, Mass.

RATIOMOTORS
The complete power package, with motor.

SOLD WITH OR WITHOUT MOTOR

FLANGED REDUCTORS
The Ratiomotor gear unit, supplied without motor. You buy and attach any motor you choose.

REDUCTORS
For mechanical drives, new 100 SERIES design saves space and weight. Housings are finned for improved cooling. Fan-cooling optional on larger sizes.

MAXIMUM HORSEPOWER PER DOLLAR
Certified
by Independent Laboratory tests

GET NEW CATALOG R-56
Lists models for any drive . . . horizontal or vertical—right angle or parallel—single or double reduction. Includes selection charts, engineering data.

1064 DIFFERENT UNITS
108 MODELS – FROM STOCK

Call your **BOSTON** *Gear* **DISTRIBUTOR**

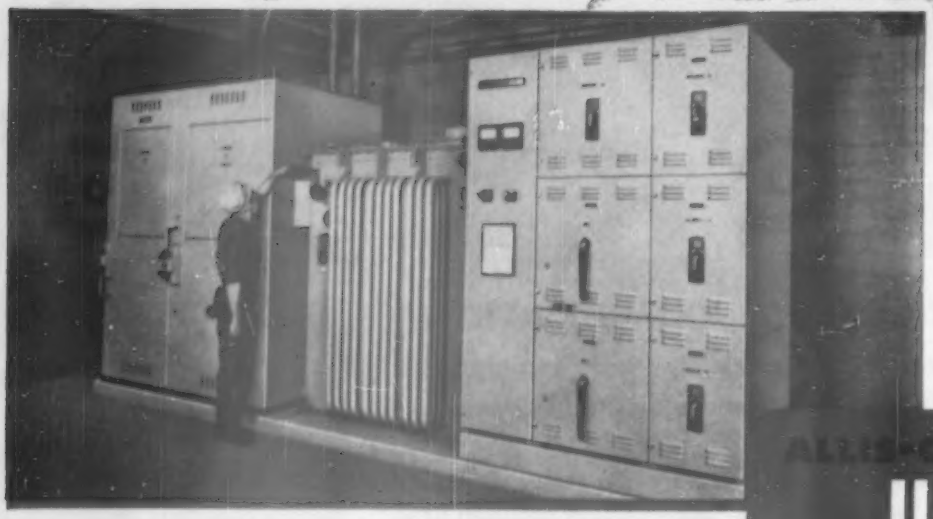
PATENTS PENDING

For nearest distributor, look under "GEARS" in the Yellow Section of your Telephone Directory.

55-BG-R-17A

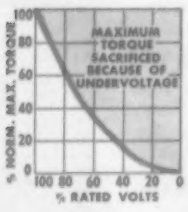
Turn Hidden Losses Into Profit

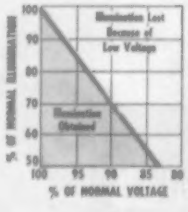
Modernize Your Plant's Electrical System



Flexible, compact units fit into any plant. Allis-Chalmers unit substations can be mounted anywhere. Tuck them into a corner of the production floor, mount them on balconies, in the basement, on the roof, or outside the building. Metal enclosures eliminate need for vaults and provide attractive appearance.

UNIT SUBSTATION





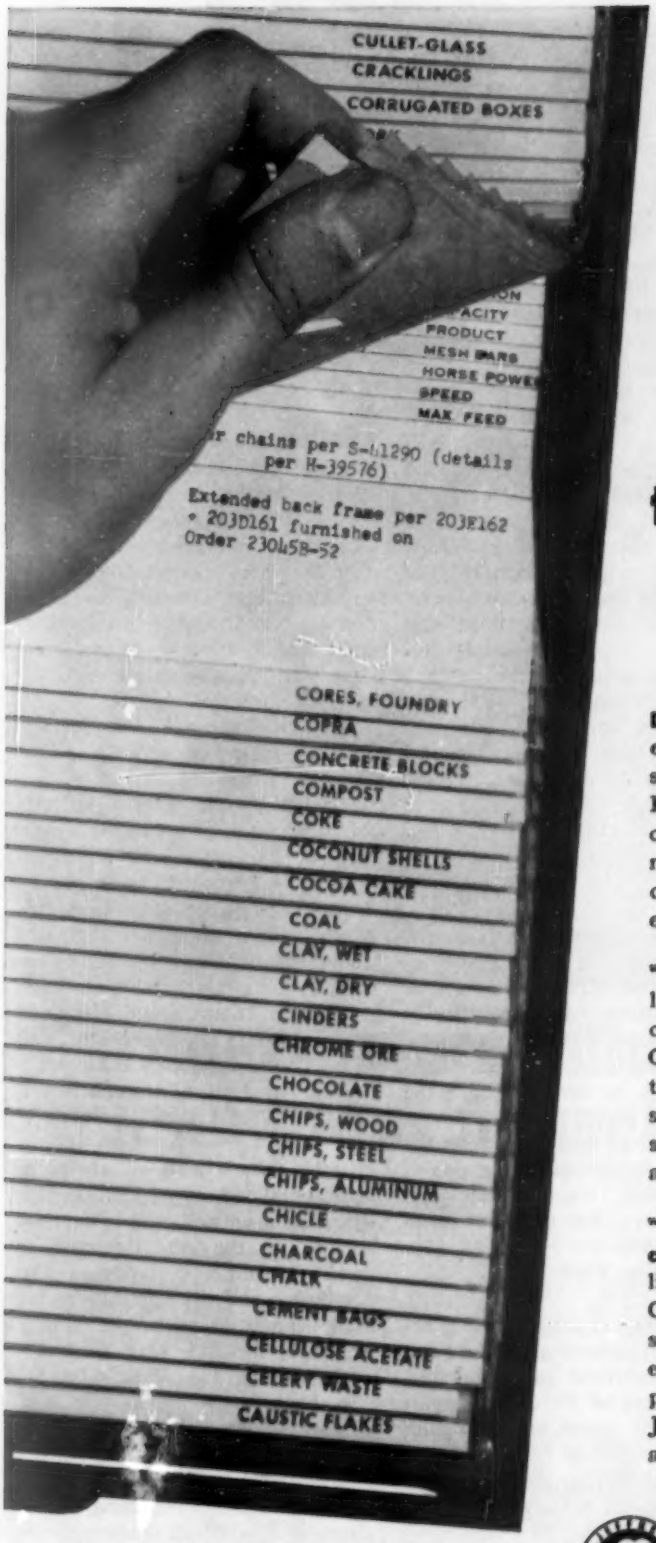
Charts Show Losses when voltage is low. Upper, torque loss at machines. Lower, illumination lost. Placing unit substations at load centers shortens low voltage cable, improves voltage, and makes future changes simpler, less costly than with many outmoded plant arrangements.

Outmoded or inadequate plant electrical systems steal profits. When voltages are low you lose in machine and operator efficiency. Dim lighting cuts inspection and assembly efficiency. Addition of new machinery to plants with older systems frequently causes extra expense for long secondary wiring.

Solve the problem with modern Allis-Chalmers unit substations. Full power is distributed from the center of load. Voltage drop and conductor losses are kept to a minimum. Expensive secondary wires to equipment are short and flexible — it is easy to make changes at little expense.

Let experienced substation engineers help solve your distribution problem. Call your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for your copy of "Power at Load Centers Pays Off."

ALLIS-CHALMERS A-4740



"what type of Crusher, Pulverizer, Shredder or Grinder do we need?"

you'll find the answers here in Jeffrey's files

During the past 60 years, Jeffrey reduction equipment has handled almost every conceivable substance, including many you'd never imagine. Our Reduction Engineers have in their files the history of all tests run on these materials, plus performance records on the machines sold for their reduction. You can check with Jeffrey and make sure of reduction equipment performance *before* you sign the order.

"But my product's new." Jeffrey's modern testing laboratory is completely equipped to determine the correct type and size of machine for a given task. Only a small amount of material is required for testing. You may witness the experiments, and results are held in strict confidence. All tests using standard equipment are made without charge to a customer.

"What machine will give us maximum efficiency and economy of operation?" The long, complete line of Jeffrey Crushers, Pulverizers, Shredders and Grinders enables us to give you the machine best suited to your specific needs. In most cases, standard equipment is recommended, with special internal parts where they are necessary. You can count on Jeffrey engineers to give you reliable and unbiased advice on crushing problems.

There is no substitute for know-how. *An outline of your reduction problems is all we need to submit recommendations. Write The Jeffrey Manufacturing Company, Columbus 16, Ohio.*

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

making a
MARKED IMPROVEMENT
in 2-COLOR
PLASTIC LID MARKING

Popular new plastic container lids present unusual marking problems. Markem—source of better marking methods for 44 years—solves them. A new Markem machine prints complete label detail and decorative or trademark designs—in two colors—on polyethylene, styrene and paperboard lids, at production rates. Automatic feed and ejection equipment is available. If your problem is marking container lids—or some other part, product or package—let Markem help you. Write Markem Machine Company, Keene 18, New Hampshire.

MARKEM ...to Make Your Mark

FACTORY | NEW FILMS

Supervisory Problems in the Plant is a series of six filmstrips (with three records) correlated with C. H. Lawshe's book, *Psychology of Industrial Relations*. Series covers typical personnel problems that occur periodically in any large-size industrial plant. Designed for use either individually to help solve one type of problem or together to present a general view of problems that face supervisory personnel. Using the case-study technique, this series is intended to aid the participants themselves to solve the problems, rather than to present actual solutions. Titles (two filmstrips to one record) are: Communications and Induction Training; Leadership Techniques and Counseling; Discipline and Complaints. 35 mm, sound, black and white, 6-9 min. each. Available for purchase ($5 per filmstrip, $8 per record, $50 for complete series) from:

Text-Film Dept., McGraw-Hill Book Co., 330 West 42nd St., New York 36.

The Search—Automation takes the viewer through the Automatic Control Center at MIT and on a tour of some automated installations in factories. Describes in detail some of the principles of automation machines, such as the feedback, the linking of a digital computer and a milling machine, etc. Discusses the threat of technological unemployment. 16mm, sound, black and white, 27 min. For rent ($6) from:

Young America Films, 18 East 41st St., New York 17.

Glass and You highlights recent developments in glass manufacture and illustrates industrial and other uses. Traces history of glass from beginnings, 16mm, sound, color, 28 min. For free loan, write:

Association Films, Inc., Broad at Elm, Ridgefield, N.J., or any branch office.

You and Your Money is a useful employee education film on economics. Uses animated cartoon to show what happens to Bill Greenstuff (the common dollar) as he progresses through economic life. Explains money volume theories, and the trend of prices based on supply and demand. Shows the role of the central banking system in the money supply. Color, sound, 12 min. Available for loan from:

Federal Reserve Bank — all branches.

Second Hundred Years is a film of general interest on the industrial progress of the country during the last century as exemplified by one manufacturing company's story over the years. Shows how the interplay between necessity and invention has contributed to this development, and its effect upon our living standards. 16 mm, sound, color, 27 min. For free loan, write:

Modern Talking Picture Service, 45 Rockefeller Plaza, New York 20.

Opportunities Unlimited is designed to show employees and management how successful the physically handicapped worker can be in industry. Points out how such employees have often equalled and sometimes surpassed able-bodied coworkers in morale, loyalty, and even production. 16mm, sound, black and white, 15 min. Available for rent ($1.50) or purchase ($35) from:

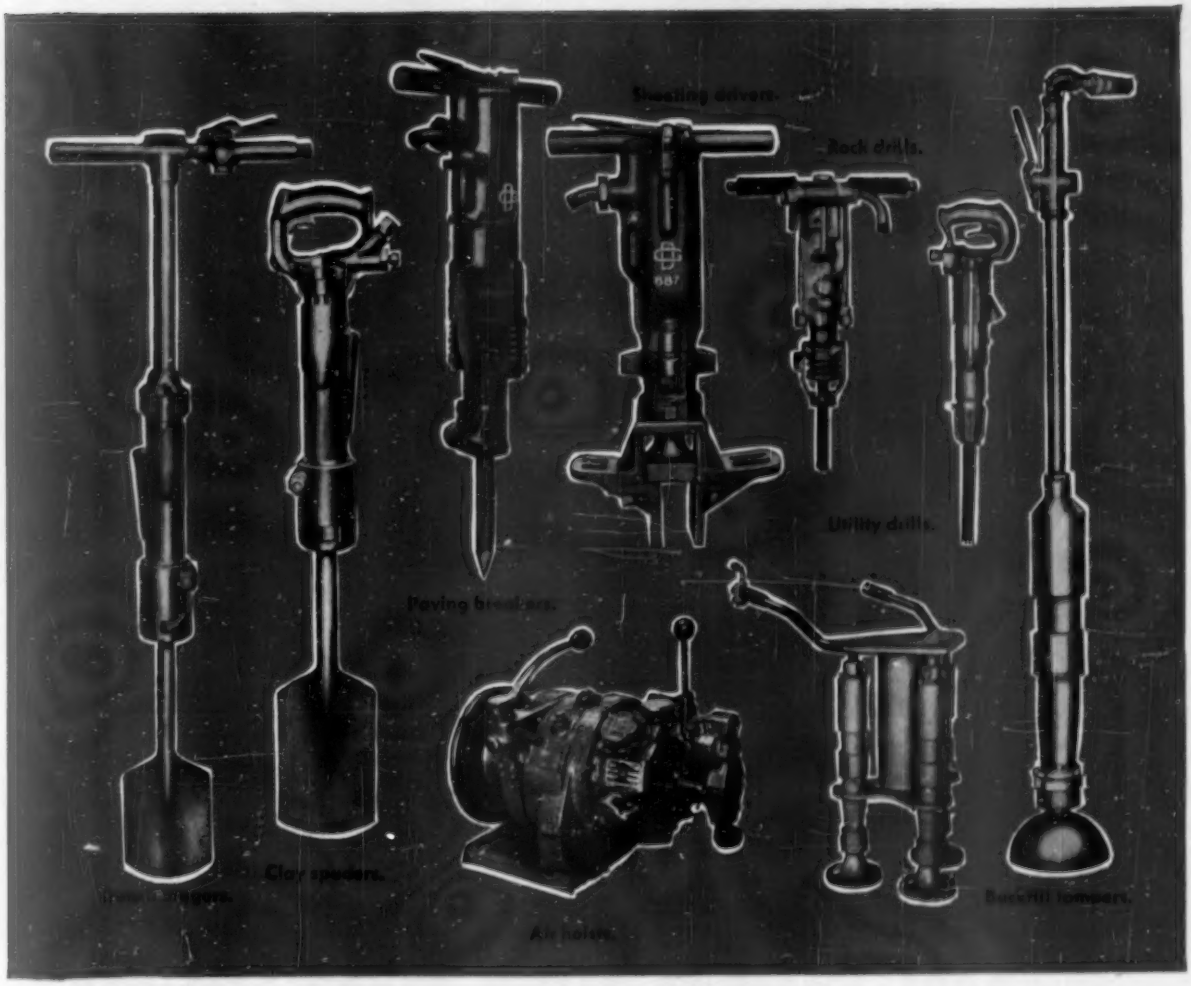
National Assn. of Manufacturers, 14 West 49th St., New York 20.

Portable Parade deals with the proper selection and use of portable pipe threading machines, both in the shop and out on the job. Describes in detail the different types of this equipment and the applications for each. 16mm, sound, color, 20 min. Available for free loan from:

Oster Mfg. Co., East 61st St., Cleveland.

Sound Slidefilm Guide contains a list of 1000 sound slidefilms on various subjects, including supervisory and industrial relations problems. Notes source of each film and states availability by purchase, rental, or free loan. For a copy of the Guide ($1), write:

Dukane Corp., Audio-Visual Division, St. Charles, Ill.



Gardner-Denver Maintenance Tools make plant housekeeping easier

Good industrial maintenance often calls for concrete demolition, masonry drilling, heavy lifting, tough digging, firm backfilling — jobs done quickly and easily by the crew that's equipped with these costsaving Gardner-Denver Air Tools —

Write for descriptive bulletin.

The Gardner-Denver WH-125 — puts compressed air where you need it for operating these tools — for cleaning — for paint spraying.

GARDNER-DENVER

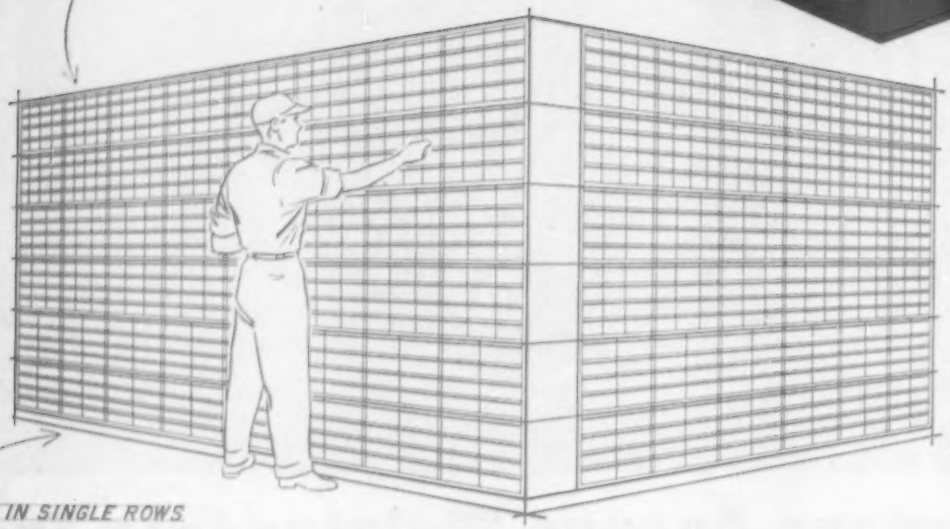
THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

HOW TO USE HALLOWELL STORAGE WALLS TO MAKE CONVENIENT STORAGE SPACE

USE THEM TO SET UP A TOOL CRIB, PARTS ROOM OR GAGE ROOM — ANYWHERE IN YOUR PLANT.



USE THEM IN SINGLE ROWS OR BACK TO BACK.

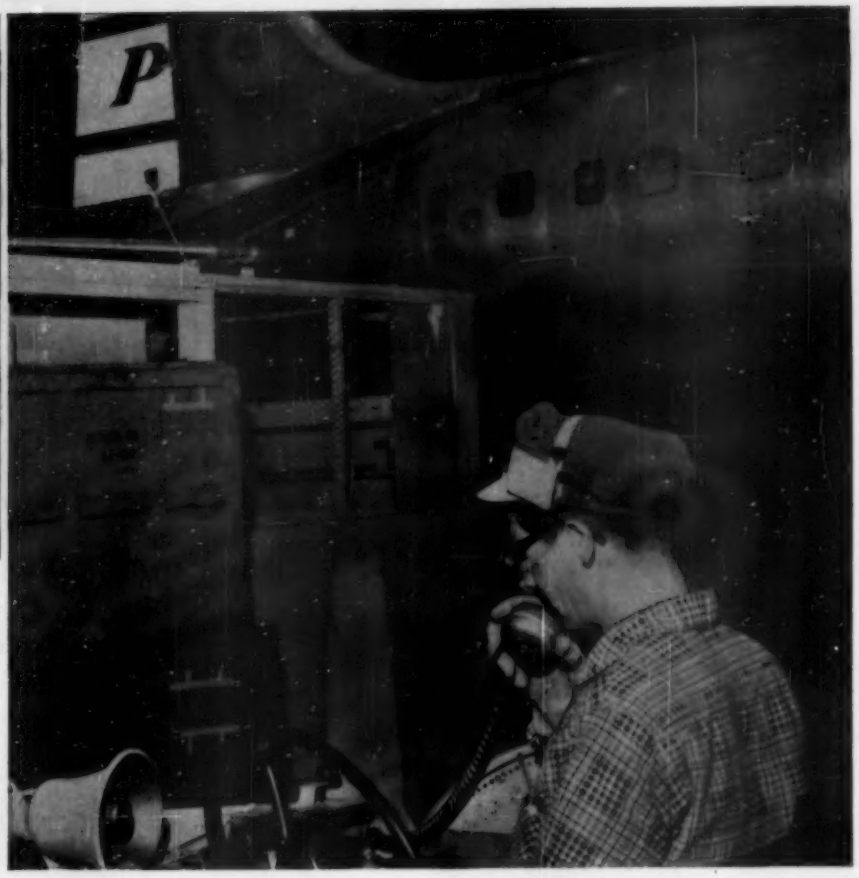
USE THEM AS ACCESSORIES TO CABINET AND WORK BENCHES OR OTHER WORK SURFACES.

Prime Cold Rolled Steel · All Welded and Finished with Baked-on Enamel · Interchangeable Drawers · 3 Different Size Drawers Can Be Intermingled in the Same Case · Stocked by Leading Shop Equipment Dealers · Send for Bulletin 2093 · Hallowell Shop Equipment Division, Standard Pressed Steel Co., Jenkintown 11, Pa.

HALLOWELL SHOP EQUIPMENT DIVISION
STANDARD PRESSED STEEL CO.
SPS
JENKINTOWN PENNSYLVANIA

BENCHES (CABINET, WORK, UNIT) • STOOLS AND CHAIRS • SHOP DESKS • TOOL STANDS AND CABINETS • DRAWERS, DRAWER TIERS • STEEL CARTS • SHELVING

G-E base station located in superintendent's office dispatches orders, controls fleets of Douglas material handling units. Vehicles handle 2 times as many jobs as before.



Request for new assignment! Douglas G-E radio equipped tractor is in constant contact with supervisors and other vehicles. Speaker on dash overrides factory noise.

RADIO-EQUIPPED MATERIALS HANDLING VEHICLES COVER TWICE AS MANY JOBS

Douglas Aircraft Finds G-E 2-Way Radio Cuts Time Between Jobs, Coordinates Facilities, And Saves Money

A profitable materials handling operation depends upon efficient control, and maximum use of all equipment. General Electric 2-way radio helps the Douglas Aircraft Company do this—and saves them money.

RADIO COORDINATES OPERATION

This world-famous builder of military and civilian aircraft has radio on handling vehicles in its Santa Monica plant. Radio-equipped fork trucks, cranes, and tractors on the job at Douglas are in constant contact with dispatcher, and each other. Wherever a vehicle is working—in a remote building, at a loading dock outdoors, *anywhere,* in this 147 acre plant—the operator is under supervision, can get new orders instantly.

SURVEY PROVES RADIO ECONOMY

In one study of radio efficiency on crane type units alone, Douglas management found that radio had reduced travel distance per job tremendously. Previously, up to 60% deadhead travel had been the case—with radio, these vehicles may handle *2 times as many jobs.* On this basis, G-E radio can pay for itself in record time.

G-E LOW POWER SYSTEM

The base station transmitter is located in the transportation supervisor's office. Mobile two-way radios are on vehicles equipped with large speakers to over-ride high factory noise levels. G-E industrial radio may be operated from any of the five DC voltage systems used by handling vehicles. Mobile units perform on either 6 or 12 volt power supplies—converters are used for 24, 32, and 64 volt trucks. Units operating inside steel buildings and in the open prove the effectiveness of the Low Power radio at Douglas.

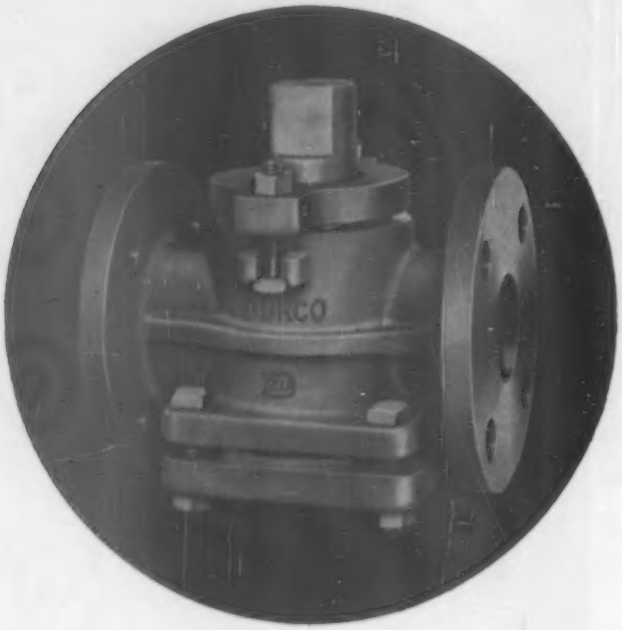
2-WAY MOBILE RADIO

INVESTIGATE G-E RADIO

A G-E Communications Counselor can show you the outstanding versatility, sturdy construction, low maintenance features of G-E Industrial Radio. Call him in, or write today to: *General Electric Company, Communication Equipment, Section X-65125, Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC



Positions wanted, corrosive

The tougher the better!

The DURCO TYPE F VALVE with Teflon sleeve offers an unusually wide range of "experience" in chemical service—from fuming nitric acid and all concentrations of sulfuric acid to the mild salts and alkalies. Service conditions range from elevated temperatures in steam traced lines to below freezing applications. Service record: excellent!

How about these qualifications for your application? (1) Non-sticking; (2) No metal-to-metal contact; (3) Needs no lubrication; (4) Requires no packing; (5) Renewable sleeve and plug.

Full technical data quickly available through your DURCO representative, or write for Bulletin V/4a

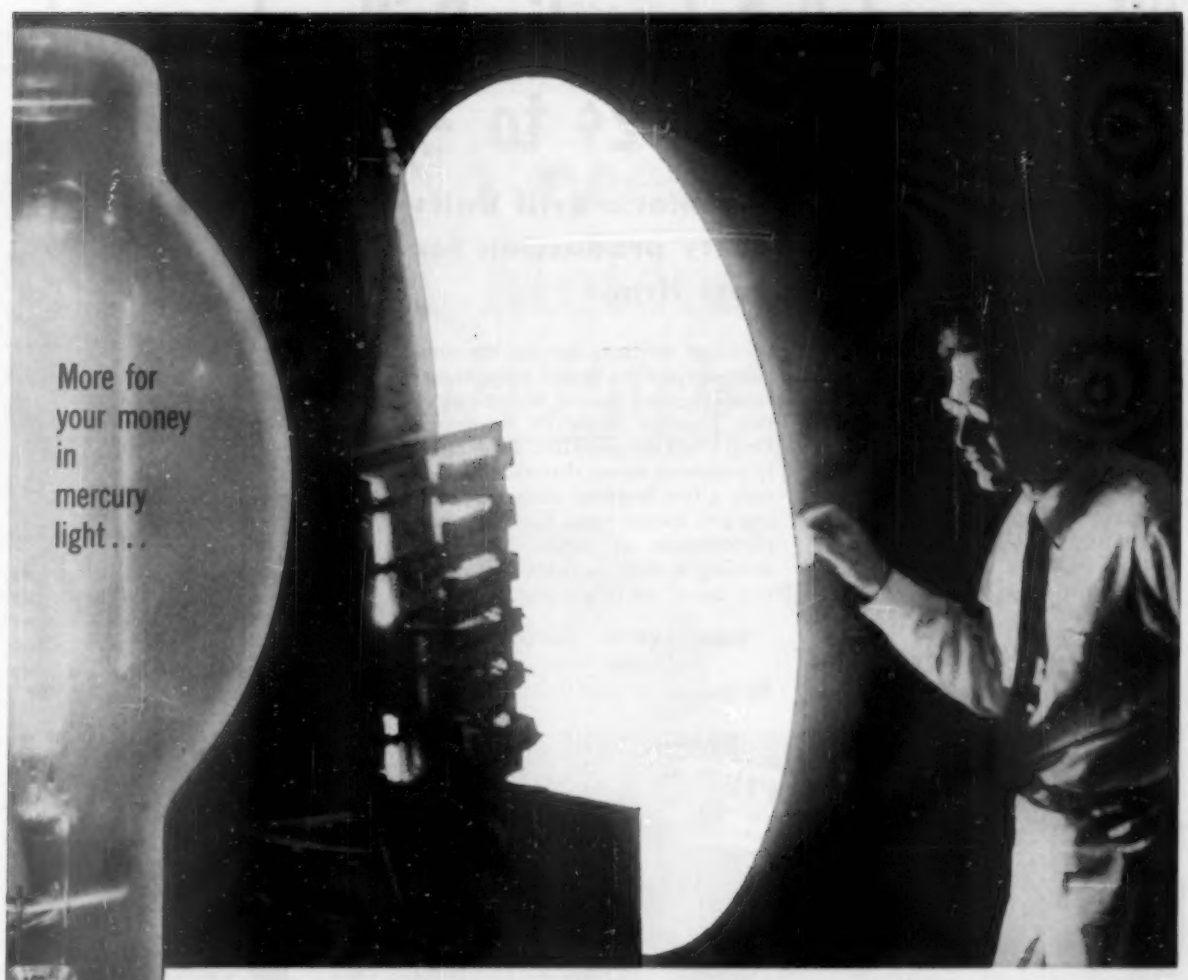
DURCO TYPE **F** VALVE

Sizes ¼" through 2", in Durimet 20, Chlorimet 2, Chlorimet 3, Monel, Nickel, and other alloys.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC., DAYTON, OHIO

Branch offices: Atlanta, Boston, Buffalo, Chicago, Cleveland, Detroit, Houston, Knoxville, Los Angeles, New York, Philadelphia, Pittsburgh



NEW, INCREASED LIGHT OUTPUT FOR 13 WESTINGHOUSE MERCURY LAMPS

Now—through advanced design and manufacturing techniques—the most widely used Westinghouse Mercury Lamps give you more light when *new*, more light *for life*.

Look at the following chart. It shows the new boost in initial light output for just two of the most widely used Westinghouse Mercury Lamps . . .

Lamp	Initial Lumens	
	Old Rating	New Rating
400-watt E-H1	20,000	21,000
400-watt J-H1	19,000	20,000

And there are similar high increases for *eleven* other popular Westinghouse Mercury Lamps.

But that's only half the story! For not only do these new, improved Westinghouse Mercury Lamps give increased light output to start with, they also *maintain* higher light output throughout their long life. For example . . .

Lamp	Approximate Lumens at 4000 Hours	
	Old	New
400-watt E-H1	15,000	15,800
400-watt J-H1	14,000	14,700

These new Westinghouse Mercury Lamps are absolutely unequalled for *long useful life*. So today, even more than before, Westinghouse Mercury Lamps are by far your best buy for all high-intensity lighting.

This significant advance in Westinghouse Mercury Lamp performance is further evidence of Westinghouse leadership in mercury lighting—one more proof that Westinghouse Mercury Lamps give you "*more for your money in mercury light.*"

Westinghouse Guarantees the service life of all its widely used types of quartz mercury lamps. For full details call your Westinghouse Lamp Representative—or write Westinghouse Lamp Div., Dept. FM-2, Bloomfield, N. J.

TYPICAL MONEY-SAVING FEATURES OF WESTINGHOUSE MERCURY LAMPS . . .

Hi-Temp life-time-tight bases—non deteriorating bonding material eliminates costly problems of loose bases, cracked bulbs, breakage when lamps are removed from sockets.

Molybdenum Ribbon Seals—just .005" thick—permit easy expansion and contraction of lead-in wires and bulb material. Result: longer lamp life, fewer early failures.

YOU CAN BE SURE...IF IT'S **Westinghouse**

Ask about new Westinghouse WEATHER DUTY(TM) Mercury Lamps!

"Home-made" Automatic Drill set-up cuts drilling cost from 2¢ to 1/10¢ per piece

Two standard Dumore Automatic Drill Units plus low-cost tooling boosts production for midwest die cast firm.

When Acme Die Casting Corp., Racine, Wisc., bid on a die cast zinc automobile door lock, their price hinged on maintaining high production rates on every phase of the operation. However, when hand drilling two opposed .160" holes, they found it impossible to hold the necessary .002" alignment tolerances as well as maintain the required high hourly production. They began looking for a solution.

Uses Dumore Advisory Service

Working closely with Dumore's Application Advisory Service, the company devised the special purpose machine pictured below. It consists of two Dumore Series 24 Automatic Drill Units designed into a completely automatic set-up that amounted to only a few hundred dollars in tooling and fixture costs. Complete synchronization of stroke, feed and drilling is made possible with effective use of micro-switches.

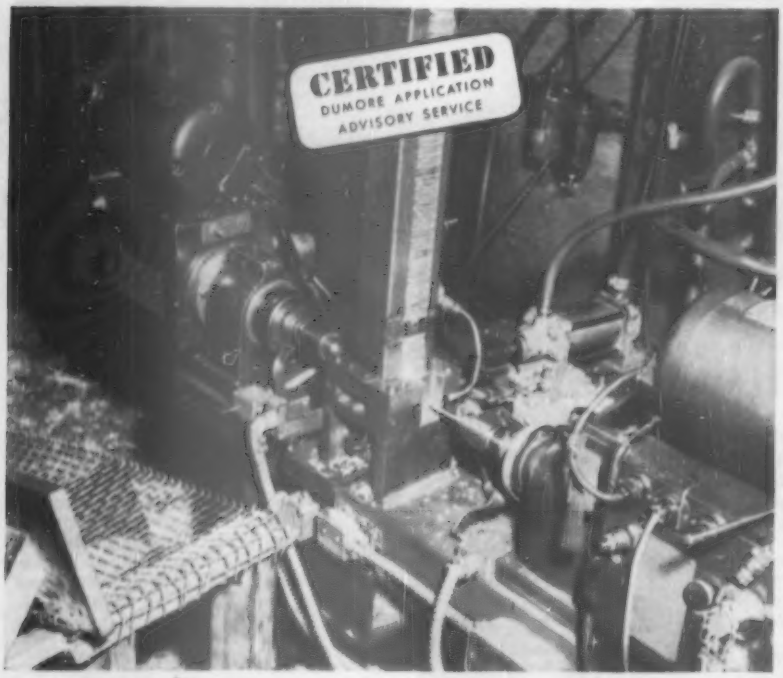
From 150 to 1500 pieces per hour

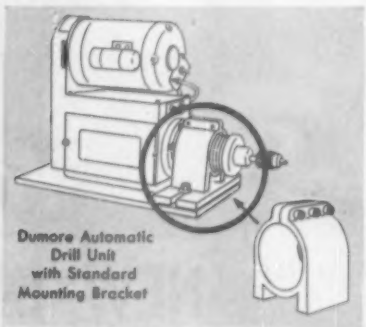
By increasing production from 150 to 1500 pieces per hour, drilling costs were reduced from 2c to 1/10c per piece. Operating at three shifts per day, the Dumore Units and tooling paid for themselves within a matter of weeks.

PART: Zinc Die Cast Automobile Door Lock.

OPERATION: Drill two opposed .160" holes, hold alignment within .002", parallelism .0015".

PRODUCTION: 1500 pieces per hour, or 25 per minute.





Dumore Automatic Drill Unit with Standard Mounting Bracket

QUICK REMOVAL and transfer of Dumore Units to other parts of the shop for drilling, tapping, reaming and other related operations is made possible with their unique nose mounting bracket. It quickly adapts Unit at any angle to existing shop equipment.

AN INEXPERIENCED OPERATOR loads the hopper while gravity feed forces the piece into the drilling fixture. The two opposed Dumore Automatic Drill Units advance simultaneously, drill, then retract to starting position—all automatically. The Dumore's built-in electrical and pneumatic controls permit almost unlimited set-up and production possibilities.

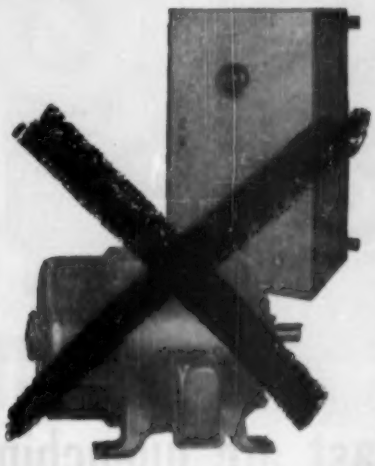
DUMORE
PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1314 SEVENTEENTH ST., RACINE, WISCONSIN

Let Dumore's Application Advisory Service help you get increased production and lower costs on jobs like this. Write for FREE Dumore Application Analysis Kit.

No need for Special Motors, Control with *Vari-Pitch* Sheaves



***Vari-Pitch* sheaves are the low cost way of providing accurate stepless speed control. There's a type and size for every need.**

Two Basic Types

1. Stationary control type can be used for infrequent speed changes when sheave is at rest.

2. Motion control type is available for applications requiring repeated speed changes while drive is in motion.

Both types are available in standard range sheaves to provide speed variations to 196%, and in wide range type sheaves to provide variations to 400%.

For complete information call your nearby A-C office or distributor — or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. A-4843

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

G-E enclosed circuit breakers are made to standard industry sizes in ratings from 10 to 600 amps. Separate stocking of breakers and enclosures means rapid delivery, keeps your inventory at minimum.

G-E molded case circuit breakers are built to meet 16 quality tests, are U/L listed

Fast arc quenching, quick make-and-break action mean durable operation for G-E circuit breakers

1. Operation is cool, life is lengthened through de-ionizing arc quencher that quickly snuffs out arc.

2. Operator can't tease contacts open or closed. Quick-make and break action of silver alloy contacts helps prevent burning.

3. Safe, positive protection against short circuits and sustained overloads with both thermal and magnetic trip.

4. Reduces costly production delays. Positive indication of "on," "off" or "tripped" permits speedy restoration of service.

5. Trip free. Cannot be held closed during a short circuit.

6. Installation simple and quick because of solderless lugs and straight-in wiring.

7. Factory sealed against tampering in sturdy, molded case.

8. Electrically and mechanically tested 16 ways for durability, safety, reliability and for accurate tripping time.

9. Available with all standard accessories for flexible use throughout industry.

10. Prevents single phasing. Common trip opens all legs of circuit.

Enclosed circuit breakers can be locked on or off, are quickly installed. Enclosures for every purpose, including lead-plated water-and-dust-tight enclosure for corrosive atmospheres. Available from your G-E Trumbull Distributor. *Trumbull Components Dept., Section 8, General Electric Company, Plainville, Conn.*

GENERAL ELECTRIC

TO TRANSFER POWER
Smoothly and efficiently from motor or engine power source on a primary drive

AS SECONDARY DRIVES
(a) Shaft to Shaft

INTRA-MACHINE
(b) Shaft to Several Shafts

TO LIFT
On materials handling, construction and similar equipment

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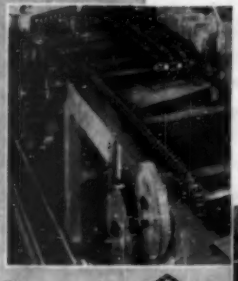

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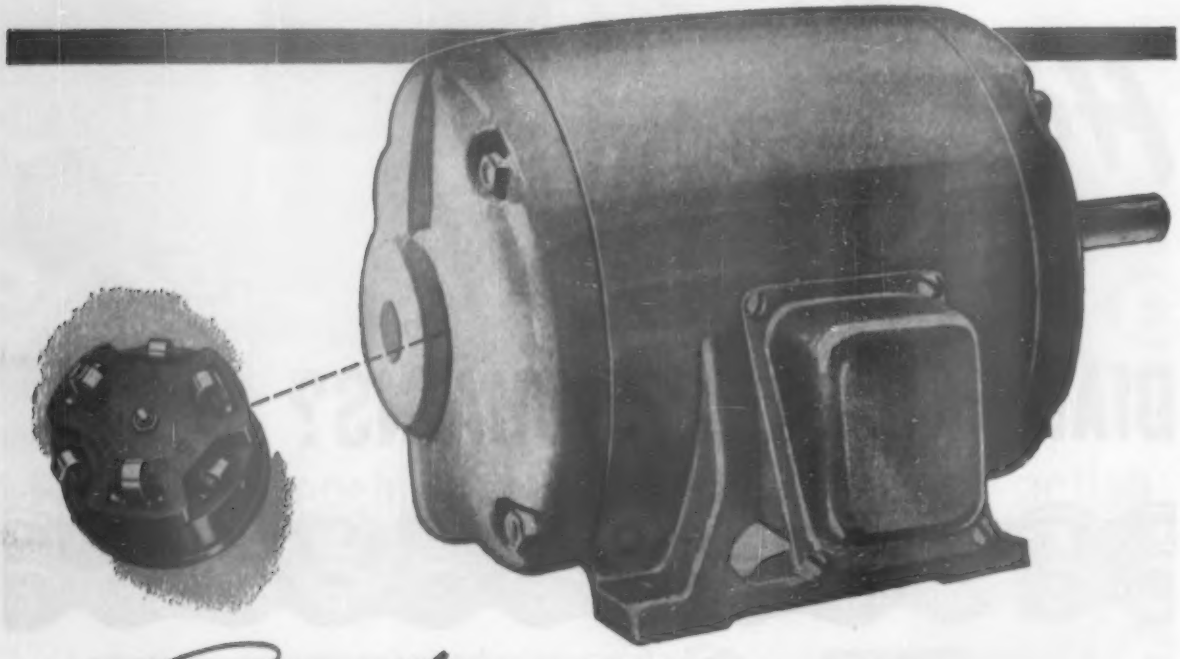
Inherent Motor Burnout Protection

That Allows Full Motor Capacity With Maximum Safety



Specify

3-Phase Motors with Built-in

KLIXON PROTECTORS

In the past, where 3-phase motors have had to rely on remote overload devices, many motor burnouts could be traced to the wrong size heater having been installed to avoid nuisance trips. The machine designer, simply by specifying motors with KLIXON Inherent Protectors, can now be assured that his motors will not burn out, yet will deliver maximum motor capacity.

KLIXON Inherent Motor Protectors provide positive protection against overheating from all running and stalled rotor conditions:

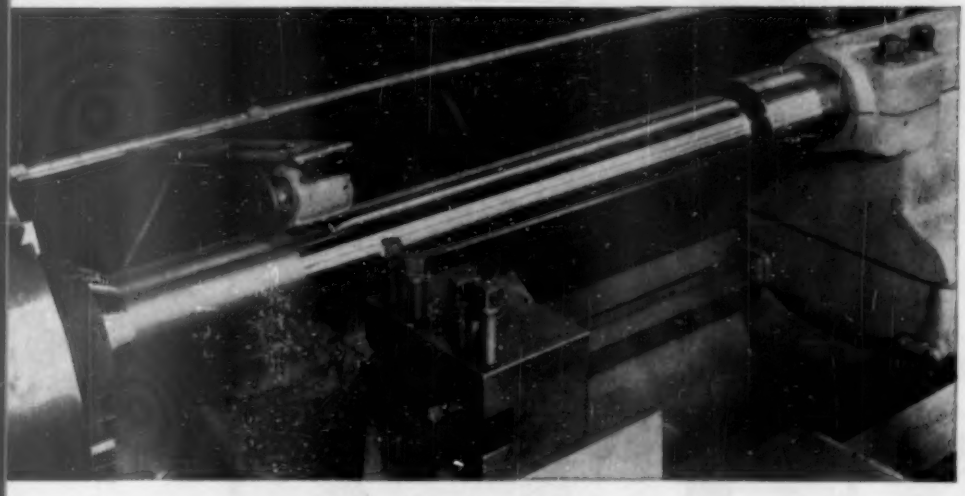
- **Extremely heavy overloads**
- **Single-phasing**
- **Stalling**
- **Failure to start**
- **Lack of ventilation**
- **Increase in ambient temperatures**
- **Plugging or reversing duty**

KLIXON 3-Phase Motor Protectors are available in four sizes — covering a range of horsepower ratings from fractional up through 7½ hp. (600V.), single or dual voltage. Write for Bulletin MOPR-1 which explains inherent motor protection.

KLIXON

METALS & CONTROLS CORPORATION
SPENCER THERMOSTAT DIVISION
412 FOREST ST., ATTLEBORO, MASS., U. S. A.

Normal speed for finishing this AISI 1045 shaft with carbide is 500 sfpm. (See tachometer above.) Only 7.4 cubic inches are removed in 2 minutes with .010" feed, 1/16" depth of cut.



With Carboloy Cemented Oxide, speed increased to 2000 sfpm, and 29.6 cubic inches were removed in the same time, under identical cutting conditions.

Limited offering available January 1 . . .

FINISH STEEL AT SPEEDS UP TO 7500 SFPM WITH NEW CARBOLOY CEMENTED OXIDE TOOLS

Carboloy® Cemented Oxide is an entirely new kind of cutting material, specially developed for steel finishing at speeds ranging from 300 to 7500 sfpm.

To date, Cemented Oxide tools have been used to cut steel with Brinell readings up to 300. Results have included more metal removed per minute, with finishes superior to those possible with carbide or HSS.

Tip stays cool

Performance evaluations at the Carboloy machinability laboratory and in customer plants prove Cemented Oxide cuts cleanly, resists edge wear and cratering. Even at extremely high operating speeds, the tip remains so cool it can be touched immediately after the cut.

Preliminary reports show Cemented Oxide can also improve efficiency of relatively low-speed equipment. Because this material provides longer tool life at higher speeds, output increases and cutting time is reduced.

Takes up where carbides leave off

Carboloy Cemented Oxide is not a typical ceramic or cermet. It is stronger and more resistant to chipping than typical ceramics. Four years in development, Cemented Oxide takes up where carbides leave off on high-speed steel finishing.

To aid full-scale commercial evaluation of Carboloy Cemented Oxide, a limited number of sizes and shapes will be available January 1. For the preliminary technical bulletin on Carboloy Cemented Oxide, write today.

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11135 E. 8 Mile Street, Detroit 32, Michigan

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For lowest cost steam generation, GE burns coal the modern way

General Electric's Major Appliance Division in Louisville, Ky., has five product manufacturing buildings, a warehouse and service buildings—over 4 million sq. ft. under roof. To generate all steam necessary for process work and heating requirements of this vast area, GE's power plant burns coal the modern way. Coal was chosen for two reasons. One, a careful fuel cost study disclosed that, on a straight economic basis, coal would give GE the lowest cost steam generation of all fuels. Second, availability of supply was considered and again coal won over other fuels. In addition, full mechanization of GE's power plant has facilitated all details of coal handling and ash removal while completely eliminating any possibility of air pollution.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

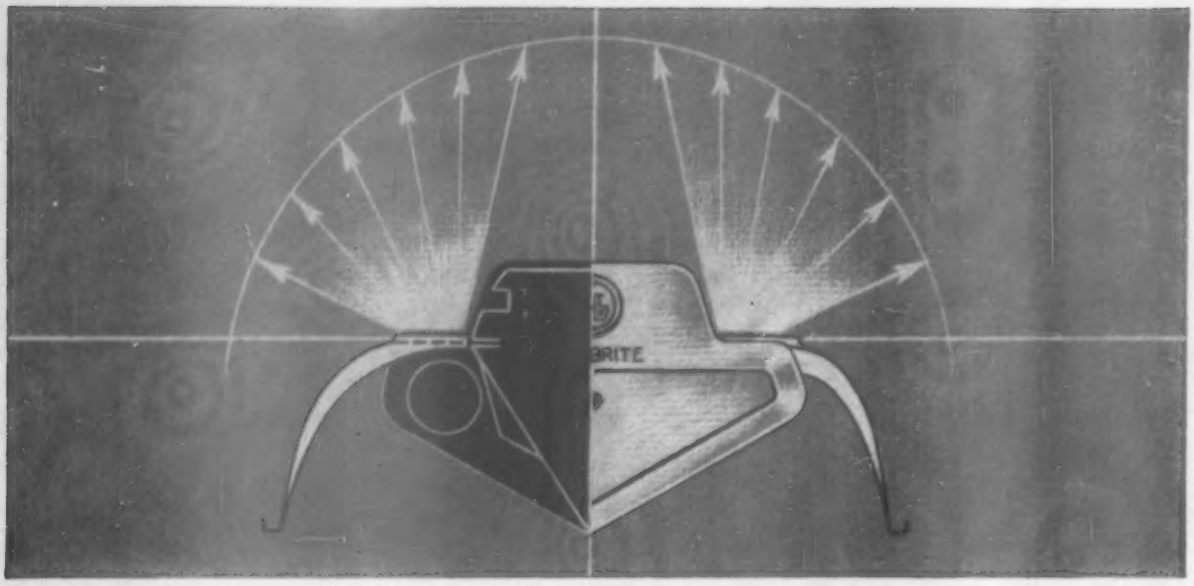
NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D. C.

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available. • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use. • No smoke or dust problems when coal is burned with modern equipment. • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.



New Day-Brite upward lighting
achieves new production highs

Visual tasks are becoming more and more acute as industry adopts new production techniques. Unusual accuracies, extreme tolerances, delicate color separations and speedy readings of charts and graphs demand the most in "see-ability" and the least in eyestrain. Both are supplied by Day-Brite new CFI (*Comfort For Industry*) lighting—especially developed to establish a high degree of visual comfort for industry workers.

Radically different lighting system

The Day-Brite CFI principle differs radically from previous design and application practices. Slotted apertures are introduced *in the tops* of the fixture reflectors—a calculated portion of the available light is directed *upward* toward the ceiling. Harsh ceiling contrasts are washed out—"hot spots" of light eliminated. Advantage is taken of the reflectance values of lighter-colored walls and ceilings. Thus, visual strain and discomfort are largely avoided—eye shock is minimized—nervous and muscular tensions are lessened. Greater accuracies are possible—spoilage is reduced—accident rates are lowered—higher standards of production are realized.

Longer life . . . lower maintenance

Several additional values are built into Day-Brite CFI units: (1) Cooler operation and consequent longer lamp and ballast life result from natural updraft ventilation; (2) This updraft ventilation helps keep reflectors clean—less maintenance and more light value result.

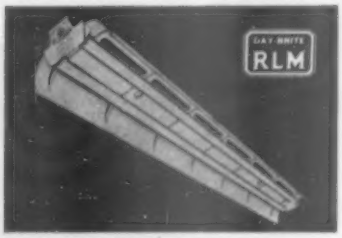
Two types of Day-Brite CFI fixtures

There are two types of Day-Brite CFI fixtures—the CFI-10, which provides for 10% *upward* lighting; the CFI-25, designed for 25% *upward* light distribution. Each of these fixtures is applicable to such installation surroundings as ceiling heights, wall and ceiling reflectances and the requirements of the visual task.

Take a look at the "comfort quotient" of the lighting in your plant. SEE, EXAMINE and COMPARE Day-Brite with any other lighting unit. Look at the fixtures, not just the pictures.

CALL YOUR DAY-BRITE LIGHTING REPRESENTATIVE. OR, SEND FOR CFI BULLETINS.

Day-Brite Lighting, Inc.,
5441 Bulwer Ave., St. Louis 7, Missouri



Day-Brite **CFI-10,** with 10% upward lighting component.

Day-Brite **CFI-25,** with 25% upward lighting component.

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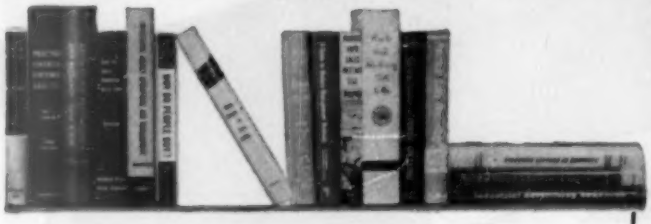

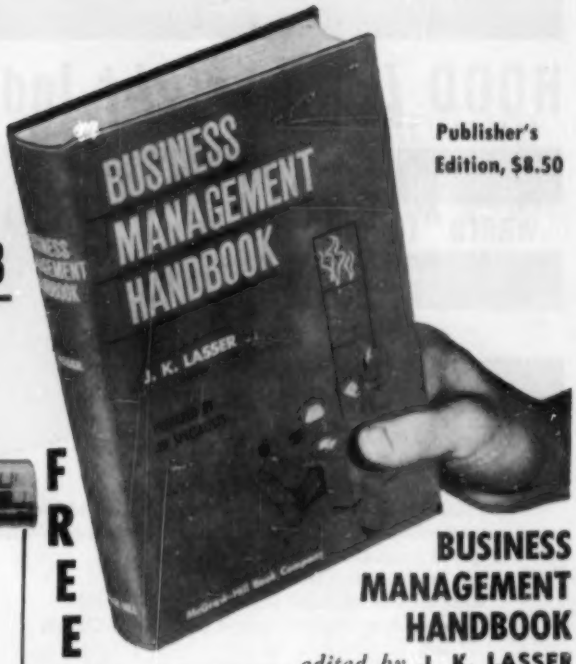

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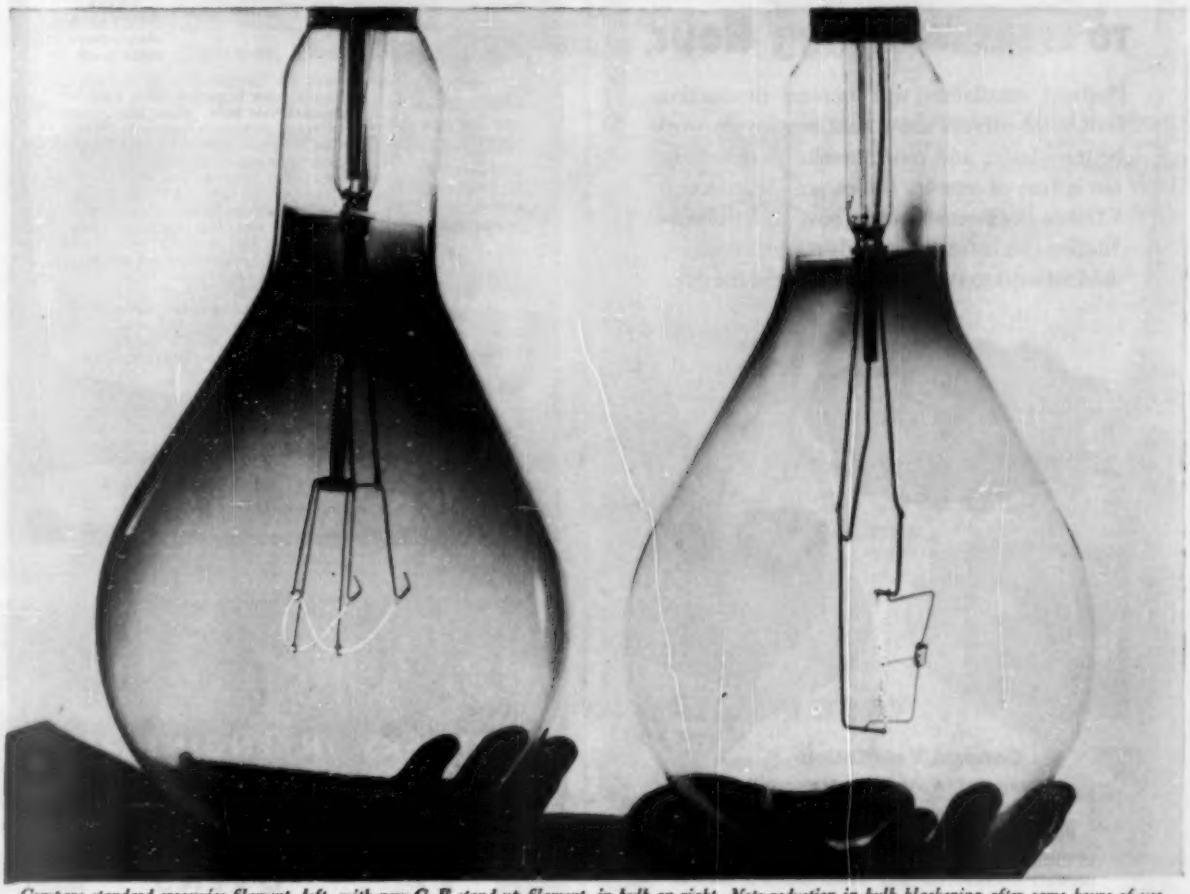
Announcing: New G-E Bonus Line of lamps, incorporating the most important development in light bulb filaments since 1913!

New G-E discovery uses revolutionary stand-up filament to give you 15% more light from a bulb



Compare standard crosswise filament, left, with new G-E stand-up filament, in bulb on right. Note reduction in bulb blackening after same hours of use.

Promises America a Yearly Light Bonus of Over $100,000,000

General Electric announces the most important development in light bulb filaments in 43 years—a filament that stands on end. It gives up to 15% more light at no increase in cost to you for current consumed.

The 750 and 1000 watt Bonus Line G-E Lamps are available now, at same list price. Other sizes from 60 to 500 watts are being redesigned to use the new stand-up filament

FOUR YEARS OF RESEARCH

At present most light bulb filaments are placed crosswise in the bulb. Four years of intensive research were required to solve the technical problems involved in changing to a vertical position.

The light gain achieved by the new stand-up positioning is a minimum of 6%. The new positioning makes it practical for the first time also to use a specially designed coiled-coil filament in bulbs of 300 watts and over. In these larger bulbs, the two improvements combine to bring the light increase to 15% during the life of the bulb—*extra light worth the entire purchase price of the bulb itself!*

LIGHT INCREASED, BLACKENING REDUCED

The new stand-up filament increases light output in two ways.

First, the hotter a filament burns the more light it gives, and the vertical position allows the filament to burn hotter without burning out any sooner.

Second, the effect of bulb blackening on light output is cut to a minimum. Deposits from the G-E stand-up filament are concentrated in the stem of the bulb when it burns base up, or in a small spot at the opposite end when burned base down. Safely out of the way in either case.

$100,000,000 LIGHT BONUS

The new line of G-E incandescent bulbs incorporating the new filament is called the G-E Bonus Line. The value of the light bonus they will ultimately deliver is estimated at over $100,000,000 a year.

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President Theodore Roosevelt Visits Panama Canal: This Bucyrus-Erie shovel, one of 77 used on the Big Ditch, was included in his 1908 inspection tour.

The highly maneuverable, precision-controlled Hydrocrane here digs footings for a new press inside the cramped quarters of an industrial plant.

. . . GIVES YOU TOP PERFORMANCE TODAY . . .

You can expect top performance from a Bucyrus-Erie Hydrocrane because it offers a combination of advantages found in no other machine. There is high speed mobility for moves around storage areas; true precision control with a unique telescoping boom that lets *this crane* work in cramped quarters and hard-to-get-at places. Hydraulically-set outriggers level it on roughest ground, provide a solid working base for fast material handling jobs. Every day, hundreds of users find that these advantages save them time and costs on a wide variety of work.

. . . PROMISES EVEN BETTER CRANES AND EXCAVATORS TOMORROW

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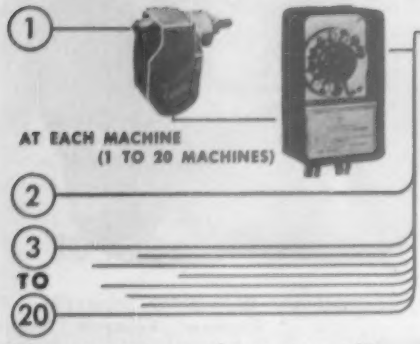

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RECORDS PRODUCTION . . .
RECORDS "DOWN TIME"
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THE REASONS FOR EACH MACHINE STOPPAGE

Why were your machines stopped?
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Air-Cooled Lighting by Dazor at Low Cost

Adjustable-Arm Models

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Light up machines and benches at rock-bottom cost and get Dazor dependability besides. New Adjustable-Arm Lamps mount solidly, hold fast in any position set. Either top- or side-mounted reflector. Air-cooled housing is safe to handle despite continuous use. Gray baked enamel over bonderizing. Call your Dazor distributor. Dazor Manufacturing Corp., St. Louis 10, Missouri.

...Makers of

DAZOR FLOATING LAMPS

IF you change your address,

please be sure to let us know promptly. It takes time to correct the stencil addressing plate. And we don't want you to miss copies of FACTORY.

Also....

be sure to give us *both*

(1) your OLD address
and
(2) your NEW address.

We need them *both* to make the change. Also confirmation of your company connection and position.

FACTORY MANAGEMENT AND MAINTENANCE
330 W. 42d St., New York 36, N. Y.

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Management Counselors
Established 1899
PRODUCTION PLANNING
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MATERIALS HANDLING
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Over 20 Years Experience
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The management consultant renders an invaluable type of service because he can devote himself exclusively and wholeheartedly to an assigned problem and is free from the routine demands of active management with which the business executive is daily confronted.

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EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

NATIONAL COVERAGE

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Positions Wanted
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The advertising rate is $33.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

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Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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Send NEW ADS to FACTORY MANAGEMENT & MAINTENANCE, 330 W. 42nd St., N. Y. 36, N. Y. for January issue closing December 13th

MANUFACTURING ENGINEER

Responsible position in an Eastern Aircraft Engine Manufacturer's plant. Duties include the resolving of major manufacturing difficulties, liaison with the Engineering and Quality Control Departments, regarding manufacturing problems and the review and analysis of manufacturing costs.

Applicants must have a degree in Mechanical or Industrial Engineering plus a minimum of ten years experience in the Manufacturing Engineering field, associated with precision machined parts, and sheet metal fabrications.

Starting salary: $8,000 or above depending on experience and qualifications. Send full information as to experience and education in first reply.

P-8481, FACTORY MANAGEMENT AND MAINTENANCE
330 W. 42nd St., New York 36, N. Y.

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With industrial engineering experience to work for well established Chicago management consulting firm on a permanent basis. Home weekends when travel is required. Work with clients will emphasize work simplification programs and some industrial engineering. Must have sound, diversified industrial background with a successful record of accomplishment in both areas of work. Engineering graduate preferred with recognized work simplification training. We are interested in a mature, broad gauged man who can handle significant assignments. Excellent opportunity and commensurate salary. Your complete resume respected in confidence.

P-8399, FACTORY MANAGEMENT & MAINTENANCE
520 N. Michigan Ave., Chicago 11, Ill.

PROJECT ENGINEER

Graduate mechanical or chemical engineer, to age 35, with technical experience in industrial ventilation, dust and fume collection or air handling for application engineering of Wheelabrator Dust and Fume Collectors. Good appearance and personality essential. Some travel. Excellent opportunity for growth with rapidly expanding department.

Send complete information to R. T. Pring, Dust and Fume Control Division.

WHEELABRATOR CORPORATION
MISHAWAKA, INDIANA

MECHANICAL ENGINEERS

Large chemical plant in West Virginia has openings for:

Senior Maintenance Engineer with up to ten years experience in chemical plant maintenance work. Must be familiar with up-to-date planning and scheduling methods. Supervisory ability essential.

Maintenance Engineer with 2 to 5 years experience in maintenance work to set up preventative maintenance procedures, redesign equipment where necessary and give technical assistance in maintenance procedures.

Project Engineers with up to 10 years experience in technical supervision of construction projects in chemical plants. Must have mechanical and process design experience.

All applicants replying should have potential for promotion. Please send resumé and salary requirements to:

Westvaco Chlor-Alkali Division
FOOD MACHINERY & CHEMICAL CORP.
Drawer 8127
South Charleston, West Virginia
Attention: Department 6.

PLANT ENGINEER

Young medium sized company located in desirable upstate New York has an excellent opportunity for an experienced Plant Engineer. Must have sound experience in all phases of plant maintenance plus a strong electrical engineering background. For the successful candidate who is aggressive and a good organizer this position offers an exceptional growth potential. Age 32-42. Send full details in confidence.

P-8394, FACTORY MANAGEMENT & MAINTENANCE
330 W. 42 St. New York 36, N. Y.

MANUFACTURING SUPERINTENDENT

Chicago area heavy equipment manufacturer employing 1000 requires executive 35 to 55 with high level experience in supervising people engaged in structural fabrication, machining, assembly and electrical manufacturing operations. Responsible for all manufacturing. M.E. or E.E. preferred but not required. Starting salary range $12,000 to $15,000. AA-11 organization. Offers real Challenge to right man. Our employees know of this ad. Include all particulars of training and experience with snapshot. All replies confidential.

P-8154, FACTORY MANAGEMENT & MAINTENANCE
520 N. Michigan Ave., Chicago 11, Ill.

PLANT MANAGER

Expanding multi-plant manufacturer requires man for new medium size plant in Southwest. Age 35-45, experienced in large sheet metal fabrication, light machining, welding, and assembly line type operation. Engineering training. Must be aggressive, a strong organizer and supervisor with a stable, progressive background. Position offers excellent growth potential. Excellent compensation. Reply in full in complete confidence.

P-8301 FACTORY MANAGEMENT & MAINTENANCE
520 N. Michigan Ave., Chicago 11, Ill.

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National Placement Center for EXECUTIVE AND TECHNICAL PERSONNEL

General and Plant Managers
Plant Superintendents—Foremen
Accounting—Staff Personnel
Engineers: Design—Production
Sales Managers—Engineers

Please outline briefly your experience or personnel needs to:

John Cope
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HArrison 7-8600

SALARIED POSITIONS $5,000—$35,000
We offer the original personal employment service (established 45 years.) Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars.
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900 Brisbane Bldg., Buffalo 3, N. Y.

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EXECUTIVES AND TECHNICAL MEN
Desiring Positions with Stability
We solicit inquiries from qualified candidates who desire to contact employers for positions paying $5000 to $25,000 per year. Confidential. Est. 39 years.
(Inquiries from Employers entail no obligation)
THE NATIONAL BUSINESS BOURSE
20 W. Jackson Blvd., Chicago 4

ASSISTANT PLANT MANAGER
Young M.E. or E.E. with experience in product development, facilities engineering, tooling or production, and the potential to soon accept responsibilities of production manager of modern 500 man plant. Starting salary $9,000-$10,000 plus bonus. Company assumes agency fee and relocation expense.
MONARCH PERSONNEL
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EMPLOYMENT

REPLIES (Box No.):
Address to office nearest you
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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

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Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-7620, Factory Management & Maintenance.

Assistant Chief Plant Engineer, B.S. Mechanical Engineering. Qualified to assume duties of Chief Engineer in near future. Must have experience with plant mechanical problems. East St. Louis, Illinois, chemical and metallurgical plant. P-8238, Factory Management & Maintenance.

EMPLOYMENT SERVICES

Salaried Personnel $5,000-$30,000. This confidential service, established 1927 is geared to needs of high grade men who seek a change of connection under conditions assuring if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. D, P.O. Box 674, Manchester, Vermont.

PROD. CONTROL MGR.

Starting Salary to $8400

Must have at least 3 yrs. exp. in metal fabrication. Prefer yg. man coming up as position will lead to higher executive duties.

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Schedule purchases, production and shipping for furniture plant with seasonal problems and growing business. Located Tacoma, Washington. Scheduling experience required and salary commensurate.

Apply by niteletter collect via Western Union, EF-WUX, Tacoma, Wash.

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L. SEEGAR

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SAN FRANCISCO, 4
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DOuglas 2-4600
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GENERAL MOTORS CORP.
1000 Lexington Ave., Rochester, N. Y.

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Classified Advertising

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$2.10 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

The advertising rate is $22.40 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. for January issue closing December 13th

View from East Side

MANUFACTURING OPPORTUNITY IN CANADA

A completely-equipped metal-working plant in Metropolitan Toronto is for sale, offering a manufacturer an excellent opportunity to locate in Canada. The all-brick building contains 95,000 square feet of space including well-appointed offices. Features include its own railroad siding and concrete flooring throughout.

Location is in an industrial section of the city, near public transportation, and an adequate labour force—both skilled and unskilled—is close at hand.

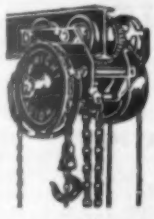
The building can be sold with or without such metal-fabricating equipment as press brakes, shears, rolls and flame cutters. Office equipment can also be included if desired.

Arrangements to inspect the premises can be made by contacting Eastern Steel Products Ltd., 394 Symington Ave., Toronto, Canada.

View from West Side

JUST IMAGINE

A 1½ ton hoist selling for *less* than a one-ton!



Yes! we're crazy! We're selling a Wright or Yale & Towne 1½ ton Trolley Hoist (Improved High-Speed Model) Timken Tapered Bearing Trolley.

FOR ONLY **$125.00**
REGULAR LIST **$390.00**
YOU SAVE **$265.00**

All new in original crates
FREIGHT PREPAID

Canvas Air-Conditioner Covers—Fits all sizes
State size when ordering
postpaid **$4.45**

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—TRANSFORMERS—

BOUGHT AND SOLD

We carry a large stock of rebuilt and guaranteed transformers, and invite your inquiries.

Custom-built transformers and coils manufactured to your specifications.

Expert Repair Service—all makes and sizes of transformers rewound, repaired and redesigned. Ask for our price schedule.

THE ELECTRIC SERVICE CO., INC.
5321 Hetzel St. — Cincinnati 27, Ohio
40 Years' Dependable Service

SPECIAL SERVICE

Time Study Equipment Boards with U.C.E.Z. transparent watch holders, stop watches, Pedometers, Slide Rules. Time study forms in stock. Sample kit free. Oznam Products Co., 5544 So. Homan Ave., Chicago 29.

WANTED

Good used steel elevated water tanks—sell us your elevated tank, if no longer needed.

We Buy—Sell—Move—Erect—New—Used Steel Elevated Water Tanks and provide paint or repair maintenance for these structures.

UNIVERSAL CONSTRUCTION COMPANY
1129 Udell St., Indianapolis 23, Indiana

LEVER PENDENT CONTROL
(illus.)
also Push-Button or Cable Control

There's a speedy dependable

ARO

PRODUCTION AIR HOIST *to fit your job!*

2,000 lb.
1,500 lb.
1,000 lb.
500 lb.
300 lb.
100 lb.

VARIABLE SPEED . . . 1000 lbs., 0 to 38′ per minute . . . 2000 lbs., 0 to 20′ per minute . . . load can be inched or zipped.

AIR-POWERED FOR SAFETY . . . no spark hazard . . . explosion-proof motor . . . can't burn out . . . can't overheat . . . unaffected by dust or fumes.

LIGHTWEIGHT . . . only 28½ lbs. for 1000 lb. hoist . . . 2000 lb. hoist weighs only 47 lbs. Overall length all models, 10½″ to 11⅛″.

TRY THIS WITH ANY OTHER HOIST!

You can inch so slowly that you can touch an egg without breaking it!

ARO ®

AIR HOIST

Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

SEE YOUR ARO DISTRIBUTOR

THE ARO EQUIPMENT CORPORATION

Bryan and Cleveland, Ohio

Aro Equipment of California, Los Angeles, Calif.
Aro Equipment of Canada, Ltd., Toronto 15, Ontario

Offices in All Principal Cities

Index To Advertisements

This index is a service to readers. Every effort is made to maintain its accuracy, but FACTORY MANAGEMENT and MAINTENANCE assumes no responsibility for errors or omissions.

Acme Steel Company 36, 37, 74
Agricola Furnace Co., Inc. 200
Air Express 44
Airtemp Div., Chrysler Corp. 258
Allegheny-Ludlum Steel Corp. 47
Allen-Bradley Company . Insert 192-193
Allen Co., Inc., L. B. 216
Allis Company, Louis 183
Allis-Chalmers Mfg. Co. . . 33, 77, 169, 280, 289
American Air Filter Co., Inc. . 240, 241
American Airlines, Inc. 294
American Blower Corp. . . . . Insert 16B
American Mutual Liability Ins. Co. 22, 23
American Optical Co. 16
American Smelting & Refining Co. 56
Amplex Div., Chrysler Corp. 61
Anchor Fence, Division of Anchor Post Products, Inc. 162
Angier Corporation 54
Ansul Chemical Co. 179
Armco Drainage & Metal Products 263
Aro Equipment Corp. 306
Arro Expansion Bolt Co. 250
Atlas Chain & Mfg. Co. 189
Automatic Electric Sales Corp. . . . 277
Automatic Transportation Co. . . . 15
Automotive Rubber Company, Inc. 196
Baker-Raulang Co. 7
Barry Controls Incorporated 78
Bassick Company 46
Bay State Abrasive Products Co. 34, 35
Benjamin Electric Mfg. Co. 259
Borroughs Mfg. Co. 262
Boston Gear Works 279
Bowers Battery & Spark Plug Co. 216
Bucyrus-Erie Company 301
Buffalo Pumps, Inc. 172
Buckeye Tools Corporation 182
Bulldog Electric Products Co. 255
Carboloy, Dept. of G.E. Co. 293
Carrier Conveyor Corporation 48
Centric Clutch Company 185
Century Electric Co. 195
Chelsea Fan & Blower Co., Inc. . . 300
Chisholm-Moore Hoist Div., Columbus-McKinnon Chain Corp. 79
Chicago Wheel & Mfg. Co. 163
Clark Equipment Company, Industrial Truck Division 215
Cleco Div., Reed Roller Bit Co. 218, 219
Cleveland Crane & Engineering Co., Machinery Division 39
Cleveland Tramrail Division, Cleveland Crane & Engineering Co. . . 38
Coffing Hoist Division, Duff-Norton Company 164
Colorado Fuel & Iron Corp. Insert 160A
Cone Automatic Machine Co., Inc. 75
Continental Steel Company 159
Dage Television, Division of Thompson Products, Inc. 176
Darnell Corporation, Ltd. 210
Day-Brite Lighting, Inc. 296
Dayton Rubber Company 234, 235
Dazor Mfg. Corp. 302
De Laval Separator Co. 201
De Laval Steam Turbine Co. 63
Delta Power Tool Div., Rockwell Mfg. Co. 157
Detrex Corporation 227
Diamond Chain Company, Inc. . . . 291
Diamond Power Specialty Corp. . . . 194
DoALL Company 225
Dodge Manufacturing Corp. 151
Dolge Company, C. B. 158
Dumore Company 288
du Pont de Nemours & Co., (Inc.) E. I. Kinetic Chemicals 171
Duriron Company, Inc. 286
Eastman Kodak Company 165
Elwell-Parker Electric Co. 13
Equipto, Div. of Aurora Equip. Co. 212
Euclid Crane & Hoist Corp. 190
Exide Industrial Division, Electric Storage Battery Co. 66
Factory M & M 268, 278
Faultless Caster Corporation 160
Ferguson Company, Harry J. 204
Finnell System, Inc. 223
Gair Company, Inc., Robert 199
Gardner-Denver Company 283
Garland Company 246
General Box Company 72
General Cable Corporation 67
General Electric Company, Apparatus Dept. . . 40, 41, 42, 43, 50, 51, 58, 59, 220, 221, 260, 261
Distribution Assemblies Dept. 230, 231
Lamp Dept. 299
Trumbull Components Dept. . . . 290
2-Way Radio 285
Georgia Department of Commerce . . 308
Gerlinger Carrier Co. 62
Goodrich Company, B. F. 1, 6
Goodyear Tire & Rubber Co. 4, 81
Gulf Oil Corporation 197
Gummed Products Company 266
Hall Laboratories, Inc. 73
Hannay & Son, Inc., Clifford B. . . 238
Harrington Company 210
Heat-Timer Corporation 262
Heller Tool Co., Subsidiary of Simonds Saw & Steel Company . . 76
Hinde & Dauch 5
Hood Rubber Company 298
Hubbell, Inc., Harvey 161
Imperial Brass Mfg. Co. 253
Industrial Development Committee of 100 238
Inertol Co., Inc. 298
Ingersoll-Rand 242, 271
I-T-E Circuit Breaker Co. 64
Jeffrey Mfg. Co. 281
Jenkins Bros. 217
Johns-Manville Corporation 274
Johnson Service Company 55
Jones & Laughlin Steel Corp. 70, 267
Katolight Corporation 216
Kent Company 252
Kentile, Inc. . . . . Insert 160B
Kimberly-Clark Corporation 264
Kinnear Mfg. Co. 178
Klemp Metal Grating Corp. 190
Korfund Company, Inc. 228
Kwikheat Mfg. Co. 204
Lamson Mobilift Corporation 184
Lamson & Sessions Co. 275
Le Roi, Division of Westinghouse Air Brake Co. . . . 21
Lewis-Shepard 17
Link-Belt Company 153, 232, 245
Lyon Metal Products, Inc. 191
Magnatrol Valve Corporation 298
Mahon Company, R. C. 65
Manheim Mfg. & Belting Company 149
Manning, Maxwell & Moore, Inc. . . 256
Markem Machine Co. 282
Master Builders Company Second Cover
Master Electric Company Fourth Cover
Mathews Conveyer Company 254
McCaskey Industrial Division, Victor Adding Machine Co. . . . 226
McGiehan, D. C. 302
McGraw-Hill Book Co. 297
Mechanical Handling Systems, Inc. 192
Micro Switch, Division of Minneapolis-Honeywell Reg. Co. 203
Minneapolis-Honeywell Regulator Co., Industrial Div. 209
Minnesota Mining & Mfg. Co. 239
Mississippi Glass Co. 273
Modine Manufacturing Company . . . 32
Monarch Marking System Co. 198
Montgomery Chamber of Commerce 248
Multi-Clean Products, Inc. 214
Muncie Gear Works, Inc. 262
National Coal Association 295
Nelson Electric Mfg. Co. 248
Newcomb-Detroit 300
N.Y. Mutual Casualty Insurance Co. 200
Niagara Blower Company 206
Nicholson & Company, W. H. 251
Norgren Company, C. A. 188
Norton Company 249
Ohio Brass Company 49
Owens-Illinois Co., Kimble Glass Div. 57
Pangborn Corporation 208
Parker-Kalon Div., General American Transportation Corp. . . 265
Permacel Tape Corporation 243
Pittsburgh Corning Corp. . . . 71, 233
Pittsburgh Plate Glass Company, Paint Division . . . . . Insert 16A
Planet Corporation 193
Plant Maintenance & Engrg. Show 155
Polyken Products, Dept. of The Kendall Company 177
Powers Regulator Co. 270
Protectoseal Company 276
Railway Express Agency 175
Ransburg Electro-Coating Corp. . . 18, 19
Rauland-Borg Company 300
Read Standard Corporation 180
Remington Rand, Inc. 147
Republic Steel Corporation 30, 31
Reznor Manufacturing Company . . . 10
Roebling's Sons Corp., John A. . . . 247
Rome Cable Corporation 173
Roots-Connersville Blower Div., Dresser Industries, Inc. 14
Rudd-Melikian, Inc. 206
Ryerson & Son, Inc., Joseph T. . . . 80
Scott Paper Company 269
Servospeed, Div. of Electro Devices, Inc. 198
Shepard Niles Crane & Hoist Corp. 186
Smith Corp., A. O. 52, 53
Spang-Chalfant Division, National Supply Co. 205
Spencer Thermostat Division, Metals & Controls Corporation 292
Square D Company . . . . . Third Cover
Standard Conveyor Company 202
Standard Oil Company 187
Standard Pressed Steel Co. . . . 213, 284
Stanley Works, Magic Door Division 244
Steel Strapping Division 174
Stratoflex, Inc. 224
Sun Oil Company . . . . . Insert 48-49
Superior Electric Company 257
Supreme Products Inc. 170
Surface Combustion Corp. 12
Sylvania Electric Products, Inc. . . . 45
Taylor Co., Halsey W. 212
Texas Company 82
Toledo Scale Company 168
Torit Mfg. Co. 216
Towmotor Corporation 9
Udylite Corporation 8
Union Wire Rope Corporation 207
Uvalde Rock Asphalt Co. 20
Valley Electric Corporation 204
Veeder-Root, Inc. 11
Wagner Electric Corporation 181
Weatherhead Company . . . 24, 25, 26, 27
Webb Co., Jervis B. 229
Westinghouse Electric Corp. 28, 29, 68, 69, 272
Lamp Division 236, 237, 287
Wheeling Corrugating Co. 211
Willys Motors, Inc. 158, 159
Worthington Corporation 60

■

Classified Advertising
F. J. Eberle, Ass't. Mgr.

■

Employment Opportunities . . . 303, 304
BUSINESS OPPORTUNITIES Offered 305
EQUIPMENT (Used or Surplus New) For Sale 305
WANTED Equipment 305

THE GLIDDEN COMPANY
IS PROVING THAT IT'S GOOD BUSINESS TO PRODUCE IN GEORGIA

THE GLIDDEN COMPANY
1396 UNION COMMERCE BUILDING

Dear Mr. Candler:

In 1953 we began operating the third of our Georgia plants, our paint manufacturing unit in Atlanta. This has since been expanded twice to meet the increasing demands for our paints in the Southeast.

In addition to our Atlanta paint facility, we operate a table margarine, mayonnaise, and salad dressing plant of our Durkee Famous Foods Division at Macon, and an important unit of our Southern Chemical Division at Valdosta. This is the world's largest pine gum processing plant.

The success of all three of these factories, and particularly the rapid growth of our Atlanta paint operations, is to us indicative of the great promise Georgia offers to American industry.

The business climate is excellent, the citizens of the state are hospitable and hardworking, and the opportunities for continued growth are impressive.

We can truthfully say that, to Glidden, the state of Georgia stands out as one of the finest places in the world in which to do business.

Cordially yours,

Dwight P. Joyce

and President

For Additional Facts and Latest Figures Write Today To Scott Candler, Secretary Dept. 43

GEORGIA DEPARTMENT OF COMMERCE
100 STATE CAPITOL · ATLANTA, GEORGIA

HERE'S A HANDY POSTCARD THAT WILL HELP YOU—

GET MORE INFORMATION

How to use this Reader Service Card . . .

The bottom of this page is a postcard—you'll note that the page has been perforated so you can tear it out easily. This postcard makes it easy for you to get more information on anything that's advertised in FACTORY, or listed in FACTORY's *Catalog News, Equipment News,* and *Materials News Sections.*

Catalog News Section: Starts on page 152. FACTORY's Editors look at scores of catalogs each month, and select those that will be most helpful to you. In the Catalog News Section of the postcard, circle the numbers corresponding to the numbers of the catalogs you want. You'll get them—without obligation—direct from the manufacturer.

Equipment News Section: Starts on page 154. Here FACTORY's Editors describe various kinds of new equipment that will help you solve plant problems. In the Equipment News Section of the postcard, circle the numbers of the items you'd like to know more about. You'll get information direct from the manufacturer—without obligation.

Materials News Section: Starts on page 266. Out of the many new materials announced each month, FACTORY's Editors pick out those most useful to you. In the Materials News Section, circle the items you want to know more about. You'll hear direct from the manufacturer—no obligation.

Advertising Section: The postcard has numbers corresponding to the page numbers of the advertisements. Circle the page numbers of those you're interested in. Where more than one advertisement is on a page, the letters L, R, T, B indicate location: left, right, top, bottom.

Then be sure: Fill out your name, address, and other information in the space provided, tear out the card, drop it in the mail. The data requested will be forwarded to you shortly.

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(Good until February 29, 1956)

. . . items in the CATALOG NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79									

. . . items in the EQUIPMENT NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105					

. . . items in the MATERIALS NEWS SECTION as circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

. . . items ADVERTISED on the pages circled below:

1	4	5	6	7	8	9	10	11	12	13	14	15	16	16a	16b	17	19	20	21	23	25
27	29	32	33	35	37	38	39	41	43	44	45	46	47	48	48a	49	51	53	54	55	56
57	59	60	61	62	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81
82	147	149	151	153	155	157	158T	158B	159T	159B	160	160a	160b	161	162	163	164	165	168	169	170
171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190T	190B	191
192	192a	193	194	195	196	197	198L	198R	199	200T	200B	201	202	203	204L	204T	204B	205	206L	206R	207
208	209	210L	210R	211	212T	212B	213	214	215	216L	216T	217	219	221	223	224	225	226	227	228	229
231	232	233	235	237	238T	238B	239	241	242	243	244	245	246	247	248T	248B	249	250	251	252	253
254	255	256	257	258	259	261	262L	262T	262B	263	264	265	266	267	269	270	271	272	273	274	275
276	277	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	298T	298L
298R	299	300L	300T	300B	301	302T	302L	306	308	Second Cover			Third Cover			Fourth Cover					

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...at FACTORY's Catalog News Section

...at FACTORY's Equipment News Section

...at FACTORY's Materials News Section

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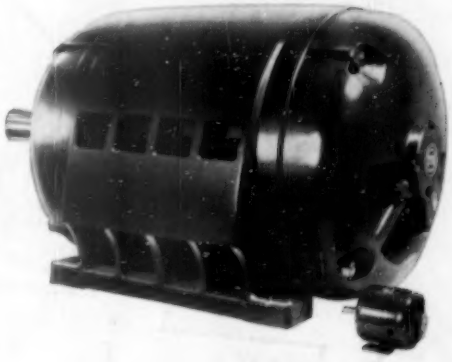

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Construction	Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.
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